```
                                1 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1972 BY VARIAN DATA MACHINE 00 00001
                                2 *                                                                    00 00002
                                3 *    V.D.M.  PART  NO.       92L0605-078A                            00 00003
                                4 *                                                                    00 00004
                                5 *                                          RELEASED    02-22-72      00 00005
                                6 *                                                                    00 00006
                                7 *              CTLP2A                                                00 00007
                                8 *                                                                    00 00008
                                9 *                                                                    00 00009
                               10         TITLE   CTLP2A                                               00 00010
                               11         NAME    CTLP2A                                               00 00011
                               12 *                                                                    00 00012
                               13 *                                                                    00 00013
                               14 *       CONTROLLER  TABLE     CTLP2A       LINE PRINTER             00 00014
                               15 *                                                                    00 00015
                               16 *       FOR  MODEL  620-f -77                                        00 00016
                               17 *                                                                    00 00017
        000000 R               18 CTLP2A  EQU     *                                                    00 00018
                               19         EXT     TBLP2A                                               00 00019
000000  000000 E               20         DATA    TBLP2A          CTACT=0, CTIDB = TBLP2A              00 00020
000001  000055 R               21         DATA    CTEND           CTADNC = END+1                       00 00021
000002  000042 A               22         DATA    042             CTOPM  = 042                         00 00022
000003  000000 A               23         DATA    0               CTDST  = 0                           00 00023
000004  000000 A               24         DATA    0               CTRQBK = 0                           00 00024
000005  000000 A               25         DATA    0               CTRTRY = 0                           00 00025
                               26         EXT     #ALP2A                                               00 00026
000006  000000 E               27         DATA    #ALP2A          CTDVAT                               00 00027
000007  002000 A               28         DATA    02000           CTIOA  = 02000                       00 00028
000010  000000 A               29         DATA    0                                                    00 00029
                               30         EXT     !BLP2A                                               00 00030
000011  000000 E               31         DATA    !BLP2A          CTBICB                               00 00031
000012  000000 A               32         DATA    0               CTFCB  = 0                           00 00032
000013  000000 A               33         DATA    0               CTWDS  = 0                           00 00033
000014  001000 A               34         DATA    01000           CTFRCT                               00 00034
000015  000023 R               35         DATA    CTBUFF          BUFFER ADDR   LP DRIVER ONLY         00 00035
000016  000000 A               36         DATA    0,0,0,0                                              00 00036
000017  000000 A
000020  000000 A
000021  000000 A
000022  000103 A               37         DATA    67,0                                                 00 00037
000023  000000 A
000023                         38 CTBUFF  BES     0                                                    00 00038
                               39         DUP     25              LP BUFFER                            00 00039
000024  000000 A               40         DATA    0                                                    00 00040
000025  000000 A               40         DATA    0                                                    00 00040
000026  000000 A               40         DATA    0                                                    00 00040
000027  000000 A               40         DATA    0                                                    00 00040
000030  000000 A               40         DATA    0                                                    00 00040
000031  000000 A               40         DATA    0                                                    00 00040
000032  000000 A               40         DATA    0                                                    00 00040
000033  000000 A               40         DATA    0                                                    00 00040
000034  000000 A               40         DATA    0                                                    00 00040
000035  000000 A               40         DATA    0                                                    00 00040
000036  000000 A               40         DATA    0                                                    00 00040
000037  000000 A               40         DATA    0                                                    00 00040
000040  000000 A               40         DATA    0                                                    00 00040
000041  000000 A               40         DATA    0                                                    00 00040
000042  000000 A               40         DATA    0                                                    00 00040
000043  000000 A               40         DATA    0                                                    00 00040
000044  000000 A               40         DATA    0                                                    00 00040
000045  000000 A               40         DATA    0                                                    00 00040
000046  000000 A               40         DATA    0                                                    00 00040
000047  000000 A               40         DATA    0                                                    00 00040
000050  000000 A               40         DATA    0                                                    00 00040
000051  000000 A               40         DATA    0                                                    00 00040
000052  000000 A               40         DATA    0                                                    00 00040
000053  000000 A               40         DATA    0                                                    00 00040
000054  000000 A               40         DATA    0                                                    00 00040
        000055 R               41 CTEND   EQU     *                                                    00 00041
        000000 R               42         END     CTLP2A                                               00 00042
ENTRY NAMES
000000 R CTLP2A
EXTERNAL NAMES
000011 E !BLP2A 000006 E #ALP2A 000000 E TBLP2A
SYMBOLS
000011 E !BLP2A 000006 E #ALP2A 000023 R CTBUFF 000055 R CTEND
000000 R CTLP2A 000000 E TBLP2A
  0 ERRORS ASSEMBLY COMPLETE

    0   !BLP2A     30     31
    0   #ALP2A     26     27
   38   CTBUFF     35
   41   CTEND      21
   18   CTLP2A     10     11     42
    0   TBLP2A     19     20
```

```
                                1 *  THIS IS A COPYRIGHTED PROGRAM, COPYRIGHT 1972 BY VARIAN DATA MACHINE  00 00001
                                2 *                                                                        00 00002
                                3 *    V.D.M.  PART  NO.      92L0603-078A                                 00 00003
                                4 *                                                                        00 00004
                                5 *                                          RELEASED    02-22-72          00 00005
                                6 *                                                                        00 00006
                                7 *          CTLP3A                                                        00 00007
                                8 *                                                                        00 00008
                                9 *                                                                        00 00009
                               10          TITLE   CTLP3A                                                  00 00010
                               11          NAME    CTLP3A                                                  00 00011
                               12 *                                                                        00 00012
                               13 *                                                                        00 00013
                               14 *       CONTROLLER  TABLE     CTLP3A        LINE PRINTER                00 00014
                               15 *                                                                        00 00015
                               16 *       FOR  MODEL  620-F -77                                           00 00016
                               17 *                                                                        00 00017
      000000 R                 18 CTLP3A  EQU     *                                                       00 00018
                               19         EXT     TBLP3A                                                  00 00019
000000 000000 E                20         DATA    TBLP3A          CTACT=0, CTIDB = TBLP3A                 00 00020
000001 000055 R                21         DATA    CTEND           CTADNC = END+1                          00 00021
000002 000042 A                22         DATA    042             CTDPM  = 042                            00 00022
000003 000000 A                23         DATA    0               CTDST  = 0                              00 00023
000004 000000 A                24         DATA    0               CTRQBK = 0                              00 00024
000005 000000 A                25         DATA    0               CTRTRY = 0                              00 00025
                               26         EXT     #ALP3A                                                  00 00026
000006 000000 E                27         DATA    #ALP3A          CTDVAT                                  00 00027
000007 002000 A                28         DATA    02000           CTIOA  = 02000                          00 00028
000010 000000 A                29         DATA    0                                                       00 00029
                               30         EXT     !BLP3A                                                  00 00030
000011 000000 E                31         DATA    !BLP3A          CTBICB                                  00 00031
000012 000000 A                32         DATA    0               CTFCB  = 0                              00 00032
000013 000000 A                33         DATA    0               CTWDS  = 0                              00 00033
000014 001000 A                34         DATA    01000           CTFRCT                                  00 00034
000015 000023 R                35         DATA    CTBUFF          BUFFER ADDR   LP DRIVER ONLY           00 00035
000016 000000 A                36         DATA    0,0,0,0                                                 00 00036
000017 000000 A
000020 000000 A
000021 000000 A
000022 000103 A                37         DATA    67,0                                                    00 00037
000023 000000 A
000023                         38 CTBUFF  BES     0                                                       00 00038
                               39         DUP     25              LP BUFFER                               00 00039
000024 000000 A                40         DATA    0                                                       00 00040
000025 000000 A                40         DATA    0                                                       00 00040
000026 000000 A                40         DATA    0                                                       00 00040
000027 000000 A                40         DATA    0                                                       00 00040
000030 000000 A                40         DATA    0                                                       00 00040
000031 000000 A                40         DATA    0                                                       00 00040
000032 000000 A                40         DATA    0                                                       00 00040
000033 000000 A                40         DATA    0                                                       00 00040
000034 000000 A                40         DATA    0                                                       00 00040
000035 000000 A                40         DATA    0                                                       00 00040
000036 000000 A                40         DATA    0                                                       00 00040
000037 000000 A                40         DATA    0                                                       00 00040
000040 000000 A                40         DATA    0                                                       00 00040
000041 000000 A                40         DATA    0                                                       00 00040
000042 000000 A                40         DATA    0                                                       00 00040
000043 000000 A                40         DATA    0                                                       00 00040
000044 000000 A                40         DATA    0                                                       00 00040
000045 000000 A                40         DATA    0                                                       00 00040
000046 000000 A                40         DATA    0                                                       00 00040
000047 000000 A                40         DATA    0                                                       00 00040
000050 000000 A                40         DATA    0                                                       00 00040
000051 000000 A                40         DATA    0                                                       00 00040
000052 000000 A                40         DATA    0                                                       00 00040
000053 000000 A                40         DATA    0                                                       00 00040
000054 000000 A                40         DATA    0                                                       00 00040
      000055 R                 41 CTEND   EQU     *                                                       00 00041
      000000 R                 42         END     CTLP3A                                                  00 00042
ENTRY NAMES
000000 R CTLP3A
EXTERNAL NAMES
000011 E !BLP3A 000006 E #ALP3A 000000 E TBLP3A
SYMBOLS
000011 E !BLP3A 000006 E #ALP3A 000023 R CTBUFF 000055 R CTEND
000000 R CTLP3A 000000 E TBLP3A
  0 ERRORS ASSEMBLY COMPLETE

    0  !BLP3A    30    31
    0  #ALP3A    26    27
   38  CTBUFF    35
   41  CTEND     21
   18  CTLP3A    10    11    42
    0  TBLP3A    19    20
```

```
                                1 *THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1974 BY VARIAN DATA MACHINES  00 00001
                                2 *                                                                       00 00002
                                3 *       V.D.M.  PART  NO.                                               00 00003
                                4 *                                                                       00 00004
                                5 *                                          RELEASED                     00 00005
                                6 *                                                                       00 00006
                                7 *       CTCD4A                                                          00 00007
                                8 *                                                                       00 00008
                                9         TITLE   CTCD4A                                                  00 00009
                               10         NAME    CTCD4A                                                  00 00010
                               11         EXT     TBCD4A                                                  00 00011
000000 000000 E                12 CTCD4A  DATA    TBCD4A                                                  00 00012
000001 000032 R                13         DATA    CTENB                                                   00 00013
000002 000002 A                14         DATA    2                                                       00 00014
000003 000000 A                15         DATA    0                                                       00 00015
000004 000000 A                16         DATA    0                                                       00 00016
000005 000000 A                17         DATA    0                                                       00 00017
                               18         EXT     #ACD4A                                                  00 00018
000006 000000 E                19         DATA    #ACD4A                                                  00 00019
000007 000000 A                20         DATA    0                                                       00 00020
000010 000000 A                21         DATA    0                                                       00 00021
000011 000000 A                22         DATA    0                                                       00 00022
000012 000000 A                23         DATA    0                                                       00 00023
000013 000000 A                24         DATA    0                                                       00 00024
000014 000000 A                25         DATA    0                                                       00 00025
000015 000000 A                26         DATA    0,0,0,0,0       TEMP STORE                              00 00026
000016 000000 A
000017 000000 A
000020 000000 A
000021 000000 A
000022 000000 A                27         DATA    0,0,0,0,0,0,0,0     PREVIOUS OUTPUTS                    00 00027
000023 000000 A
000024 000000 A
000025 000000 A
000026 000000 A
000027 000000 A
000030 000000 A
000031 000000 A
       000032 R                28 CTEND   EQU     *                                                       00 00028
                               29         END                                                             00 00029
ENTRY NAMES
000000 R CTCD4A
EXTERNAL NAMES
000006 E #ACD4A 000000 E TBCD4A
SYMBOLS
000006 E #ACD4A 000000 R CTCD4A 000032 R CTEND  000000 E TBCD4A
  0 ERRORS ASSEMBLY COMPLETE

    0   #ACD4A     18     19
   12   CTCD4A      9     10
   28   CTEND      13
    0   TBCD4A     11     12
```

```
                                1 *THIS IS A COPYRIGHTED PROGRAM, COPYRIGHT 1974 BY VARIAN DATA MACHINES   00 00001
                                2 *                                                                        00 00002
                                3 *      V.D.M.  PART  NO.                                                 00 00003
                                4 *                                                                        00 00004
                                5 *                                    RELEASED                            00 00005
                                6 *                                                                        00 00006
                                7 *      CTC05A                                                            00 00007
                                8 *                                                                        00 00008
                                9         TITLE   CTC05A                                                   00 00009
                               10         NAME    CTC05A                                                   00 00010
                               11         EXT     TBC05A                                                   00 00011
000000 000000 E                12 CTC05A  DATA    TBC05A                                                   00 00012
000001 000032 R                13         DATA    CTEND                                                    00 00013
000002 000002 A                14         DATA    2                                                        00 00014
000003 000000 A                15         DATA    0                                                        00 00015
000004 000000 A                16         DATA    0                                                        00 00016
000005 000000 A                17         DATA    0                                                        00 00017
                               18         EXT     #AC05A                                                   00 00018
000006 000000 E                19         DATA    #AC05A                                                   00 00019
000007 000000 A                20         DATA    0                                                        00 00020
000010 000000 A                21         DATA    0                                                        00 00021
000011 000000 A                22         DATA    0                                                        00 00022
000012 000000 A                23         DATA    0                                                        00 00023
000013 000000 A                24         DATA    0                                                        00 00024
000014 000000 A                25         DATA    0                                                        00 00025
000015 000000 A                26         DATA    0,0,0,0,0      TEMP STORE                                00 00026
000016 000000 A
000017 000000 A
000020 000000 A
000021 000000 A
000022 000000 A                27         DATA    0,0,0,0,0,0,0,0,    PREVIOUS OUTPUTS                     00 00027
000023 000000 A
000024 000000 A
000025 000000 A
000026 000000 A
000027 000000 A
000030 000000 A
000031 000000 A
       000032 R                28 CTEND   EQU     *                                                        00 00028
                               29         END                                                              00 00029
ENTRY NAMES
000000 R CTC05A
EXTERNAL NAMES
000006 E #AC05A 000000 E TBC05A
SYMBOLS
000006 E #AC05A 000000 R CTC05A 000032 R CTEND  000000 E TBC05A
  0 ERRORS ASSEMBLY COMPLETE

    0   #AC05A     18     19
   12   CTC05A      9     10
   28   CTEND      13
    0   TBC05A     11     12
```

```
                                1 *THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1974 BY VARIAN DATA MACHINES  00 00001
                                2 *                                                                       00 00002
                                3 *       V.D.M.  PART  NO.                                               00 00003
                                4 *                                                                       00 00004
                                5 *                                          RELEASED                     00 00005
                                6 *                                                                       00 00006
                                7 *       CTCD6A                                                          00 00007
                                8 *                                                                       00 00008
                                9         TITLE   CTCD6A                                                  00 00009
                               10         NAME    CTCD6A                                                  00 00010
                               11         EXT     TBCD6A                                                  00 00011
000000 000000 E                12 CTCD6A  DATA    TBCD6A                                                  00 00012
000001 000032 R                13         DATA    CTEND                                                   00 00013
000002 000002 A                14         DATA    2                                                       00 00014
000003 000000 A                15         DATA    0                                                       00 00015
000004 000000 A                16         DATA    0                                                       00 00016
000005 000000 A                17         DATA    0                                                       00 00017
000006 000000 E                18         EXT     #ACD6A                                                  00 00018
000007 000000 E                19         DATA    #ACD6A                                                  00 00019
000010 000000 A                20         DATA    0                                                       00 00020
000011 000000 A                21         DATA    0                                                       00 00021
000012 000000 A                22         DATA    0                                                       00 00022
000013 000000 A                23         DATA    0                                                       00 00023
000014 000000 A                24         DATA    0                                                       00 00024
000015 000000 A                25         DATA    0,0,0,0,0      TEMP STORE                               00 00025
000016 000000 A
000017 000000 A
000020 000000 A
000021 000000 A
000022 000000 A                27         DATA    0,0,0,0,0,0,0,0    PREVIOUS OUTPUTS                     00 00027
000023 000000 A
000024 000000 A
000025 000000 A
000026 000000 A
000027 000000 A
000030 000000 A
000031 000000 A
       000032 R                28 CTEND   EQU     *                                                       00 00028
                               29         END                                                             00 00029
ENTRY NAMES
000000 E CTCD6A
EXTERNAL NAMES
000006 E #ACD6A 000000 E TBCD6A
SYMBOLS
000006 E #ACD6A 000000 R CTCD6A 000032 R CTEND  000000 E TBCD6A
   0 ERRORS ASSEMBLY COMPLETE

    0  #ACD6A    10     19
   12  CTCD6A     9     10
   28  CTEND     17
    0  TBCD6A    11     12
```

```
                                1 *THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1974 BY VARIAN DATA MACHINES  00 00001
                                2 *                                                                       00 00002
                                3 *      V.D.M.  PART  NO.                                                00 00003
[redacted]                      4 *                                                                       00 00004
                                5 *                          RELEASE                                      00 00005
                                6 *                                                                       00 00006
                                7 *      CTC07A                                                           00 00007
                                8 *                                                                       00 00008
                                9        TITLE   CTC07A                                                  00 00009
                               10        NAME    CTC07A                                                  00 00010
                               11        EXT     TBC07A                                                  00 00011
000000  000000  E    12 CTC07A DATA    TBC07A                                                            00 00012
000001  000032  R    13        DATA    CTEND                                                             00 00013
000002  000002  A    14        DATA    2                                                                 00 00014
000003  000000  A    15        DATA    0                                                                 00 00015
000004  000000  A    16        DATA    0                                                                 00 00016
000005  000000  A    17        DATA    0                                                                 00 00017
                     18        EXT     #AC07A                                                            00 00018
000006  000000  E    19        DATA    #AC07A                                                            00 00019
000007  000000  A    20        DATA    0                                                                 00 00020
000010  000000  A    21        DATA    0                                                                 00 00021
000011  000000  A    22        DATA    0                                                                 00 00022
000012  000000  A    23        DATA    0                                                                 00 00023
000013  000000  A    24        DATA    0                                                                 00 00024
000014  000000  A    25        DATA    0                                                                 00 00025
000015  000000  A    26        DATA    0,0,0,0,0     TEMP STORE                                          00 00026
000016  000000  A
000017  000000  A
000020  000000  A
000021  000000  A
000022  000000  A    27        DATA    0,0,0,0,0,0,0,0    PREVIOUS OUTPUTS                               00 00027
000023  000000  A
000024  000000  A
000025  000000  A
000026  000000  A
000027  000000  A
000030  000000  A
000031  000000  A
        000032  R    28 CTEND  EQU     *                                                                 00 00028
                     29        END                                                                       00 00029
ENTRY NAMES
000000  R CTC07A
EXTERNAL NAMES
000006  E #AC07A 000000  E TBC07A
SYMBOLS
000006  E #AC07A 000000  R CTC07A 000032  R CTEND  000000  E TBC07A
  0 ERRORS ASSEMBLY COMPLETE


    0   #AC07A     18     19
   12   CTC07A      9     10
   28   CTEND      13
    0   TBC07A     11     12
```

```
                     1 *THIS IS A COPYRIGHTED PROGRAM,COPYRIGHT 1974 BY VARIAN DATA MACHINES
                     2 *
                     3 *     V.D.M.  PART  NO.        92L0605-158A
                     4 *
                     5 *                                              RELEASE
                     6 *
                     7 *                 CTCI4A
                     8 *
                     9 *
                    10          TITLE   .CTCI4A
                    11          NAME    'CTCI4A
                    12 *
                    13 *
                    14 *        CONTROLLER TABLE        CTCI4A
                    15 *
                    16 *        FOR MODELS 620-831A/B DIM,620-850/851 ADC
                    17 *                              620-860/860A,-861/861A MUX
                    18 *
                    19          EXT     TBCI4A
000000  000000  E   20 CTCI4A   DATA    TBCI4A
000001  000021  R   21          DATA    CTEND
000002  000041  A   22          DATA    >41
000003  000000  A   23          DATA    >0
000004  000000  A   24          DATA    >0
000005  000000  A   25          DATA    >0
                    26          EXT     ABCI4A
000006  000000  E   27          DATA    #ACI4A
                    28          EXT     BDCI4A
000007  000006  E   29          DATA    #DCI4A
000010  000000  A   30          DATA    >0
                    31          EXT     BCI4A
000011  000000  E   32          DATA    #BCI4A
000012  000000  A   33          DATA    >0
000013  000000  A   34          DATA    >0
000014  000000  A   35          DATA    >0
                    36          EXT     BMCI4A
000015  000000  E   37          DATA    #MCI4A
000016  000000  A   38          DATA    >0
000017  000000  A
000020  000000  A
        000021  R   39 CTEND    EQU     *
                    40          END
```

ENTRY NAMES
000000 R CTCI4A
EXTERNAL NAMES
000011 E #BCI4A 000006 E #ACI4A 000007 E #DCI4A 000015 E #MCI4A
000000 E TBCI4A
SYMBOLS
000011 E #BCI4A 000006 E #ACI4A 000007 E #DCI4A 000015 E #MCI4A
000000 R CTCI4A 000021 R CTEND 000000 E TBCI4A
0 ERRORS ASSEMBLY COMPLETE

```
                    1 *THIS IS A COPYRIGHTED PROGRAM.COPYRIGHT 1974 BY VARIAN DATA MACHINES    00 00001
                    2 *                                                                        00 00002
                    3 *     V.D.M.  PART  NO.        92L0605-158A                              00 00003
                    4 *                                                                        00 00004
                    5 *                                                RELEASED    03/01/74    00 00005
                    6 *                                                                        00 00006
                    7 *              CTCI5A                                                    00 00007
                    8 *                                                                        00 00008
                    9 *                                                                        00 00009
                   10          TITLE   CTCI5A                                                  00 00010
                   11          NAME    CTCI5A                                                  00 00011
                   12 *                                                                        00 00012
                   13 *                                                                        00 00013
                   14 *        CONTROLLER TABLE      CTCI5A                                    00 00014
                   15 *                                                                        00 00015
                   16 *        FOR MODELS 620-831A/B DIM,620-850/851 ADC                       00 00016
                   17 *                              620-860/860A,-861/861A MUX                00 00017
                   18 *                                                                        00 00018
                   19          EXT     TBCI5A                                                  00 00019
C00000 000000 E    20 CTCI5A   DATA    TBCI5A                                                  00 00020
000001 000021 R    21          DATA    CTEND                                                   00 00021
000002 000041 A    22          DATA    041                                                     00 00022
000003 000000 A    23          DATA    0                                                       00 00023
000004 000000 A    24          DATA    0                                                       00 00024
000005 000000 A    25          DATA    0                                                       00 00025
                   26          EXT     #ACI5A                                                  00 00026
000006 000000 E    27          DATA    #ACI5A                                                  00 00027
                   28          EXT     #DCI5A                                                  00 00028
000007 000000 E    29          DATA    #DCI5A                                                  00 00029
000010 000000 A    30          DATA    0                                                       00 00030
                   31          EXT     !BCI5A                                                  00 00031
000011 000000 E    32          DATA    !BCI5A                                                  00 00032
000012 000000 A    33          DATA    0                                                       00 00033
000013 000000 A    34          DATA    0                                                       00 00034
000014 000000 A    35          DATA    0                                                       00 00035
                   36          EXT     #MCI5A                                                  00 00036
000015 000000 E    37          DATA    #MCI5A                                                  00 00037
000016 000000 A    38          DATA    0,0,0                                                   00 00038
000017 000000 A
000020 000000 A
       000021 R    39 CTEND    EQU     *                                                       00 00039
                   40          END                                                             00 00040
ENTRY NAMES
000000 R CTCI5A
EXTERNAL NAMES
000011 E !BCI5A 000006 E #ACI5A 000007 E #DCI5A 000015 E #MCI5A
000000 E TBCI5A
SYMBOLS
000011 E !BCI5A 000006 E #ACI5A 000007 E #DCI5A 000015 E #MCI5A
000000 R CTCI5A 000021 R CTEND  000000 E TBCI5A
  0 ERRORS ASSEMBLY COMPLETE
```

```
                    1 *THIS IS A COPYRIGHTED PROGRAM.COPYRIGHT 1974 BY VARIAN DATA MACHINES    00 00001
                    2 *                                                                        00 00002
                    3 *     V.D.M.  PART  NO.       92L0605-158A                               00 00003
                    4 *                                                                        00 00004
                    5 *                                                RELEASED    03/01/74    00 00005
                    6 *                                                                        00 00006
                    7 *              CTCI6A                                                    00 00007
                    8 *                                                                        00 00008
                    9 *                                                                        00 00009
                   10         TITLE   CTCI6A                                                  00 00010
                   11         NAME    CTCI6A                                                  00 00011
                   12 *                                                                       00 00012
                   13 *                                                                       00 00013
                   14 *       CONTROLLER TABLE       CTCI6A                                  00 00014
                   15 *                                                                       00 00015
                   16 *       FOR MODELS 620-831A/B DIM,620-850/851 ADC                       00 00016
                   17 *                             620-860/860A,-861/861A MUX                00 00017
                   18 *                                                                       00 00018
                   19         EXT     TBCI6A                                                  00 00019
000000 000000 E    20 CTCI6A  DATA    TBCI6A                                                  00 00020
000001 000021 R    21         DATA    CTEND                                                   00 00021
000002 000041 A    22         DATA    041                                                     00 00022
000003 000000 A    23         DATA    0                                                       00 00023
000004 000000 A    24         DATA    0                                                       00 00024
000005 000000 A    25         DATA    0                                                       00 00025
                   26         EXT     #ACI6A                                                  00 00026
000006 000000 E    27         DATA    #ACI6A                                                  00 00027
                   28         EXT     #DCI6A                                                  00 00028
000007 000000 E    29         DATA    #DCI6A                                                  00 00029
000010 000000 A    30         DATA    0                                                       00 00030
                   31         EXT     !BCI6A                                                  00 00031
000011 000000 E    32         DATA    !BCI6A                                                  00 00032
000012 000000 A    33         DATA    0                                                       00 00033
000013 000000 A    34         DATA    0                                                       00 00034
000014 000000 A    35         DATA    0                                                       00 00035
                   36         EXT     #MCI6A                                                  00 00036
000015 000000 E    37         DATA    #MCI6A                                                  00 00037
000016 000000 A    38         DATA    0,0,0                                                   00 00038
000017 000000 A
000020 000000 A
       000021 R    39 CTEND   EQU     *                                                       00 00039
                   40         END                                                             00 00040
ENTRY NAMES
000000 R CTCI6A
EXTERNAL NAMES
000011 E !BCI6A 000006 E #ACI6A 000007 E #DCI6A 000015 E #MCI6A
000000 E TBCI6A
SYMBOLS
000011 E !BCI6A 000006 E #ACI6A 000007 E #DCI6A 000015 E #MCI6A
000000 R CTCI6A 000021 R CTEND  000000 E TBCI6A
  0 ERRORS ASSEMBLY COMPLETE
```

```
                                1 *THIS IS A COPYRIGHTED PROGRAM.COPYRIGHT 1974 BY VARIAN DATA MACHINES    00 00001
                                2 *                                                                        00 00002
                                3 *     V.D.M.  PART  NO.       92L0605-158A                               00 00003
                                4 *                                                                        00 00004
                                5 *                                          RELEASED    03/01/74      00 00005
                                6 *                                                                        00 00006
                                7 *              CTCI7A                                                    00 00007
                                8 *                                                                        00 00008
                                9 *                                                                        00 00009
                               10         TITLE   CTCI7A                                                   00 00010
                               11         NAME    CTCI7A                                                   00 00011
                               12 *                                                                        00 00012
                               13 *                                                                        00 00013
                               14 *       CONTROLLER TABLE      CTCI7A                                     00 00014
                               15 *                                                                        00 00015
                               16 *       FOR MODELS 620-831A/B DIM,620-850/851 ADC                        00 00016
                               17 *                             620-860/860A,-861/861A MUX                00 00017
                               18 *                                                                        00 00018
                               19         EXT     TBCI7A                                                   00 00019
000000 000000 E                20 CTCI7A  DATA    TBCI7A                                                   00 00020
000001 000021 R                21         DATA    CTEND                                                    00 00021
000002 000041 A                22         DATA    041                                                      00 00022
000003 000000 A                23         DATA    0                                                        00 00023
000004 000000 A                24         DATA    0                                                        00 00024
000005 000000 A                25         DATA    0                                                        00 00025
                               26         EXT     #ACI7A                                                   00 00026
000006 000000 E                27         DATA    #ACI7A                                                   00 00027
                               28         EXT     #DCI7A                                                   00 00028
000007 000000 E                29         DATA    #DCI7A                                                   00 00029
000010 000000 A                30         DATA    0                                                        00 00030
                               31         EXT     !BCI7A                                                   00 00031
000011 000000 E                32         DATA    !BCI7A                                                   00 00032
000012 000000 A                33         DATA    0                                                        00 00033
000013 000000 A                34         DATA    0                                                        00 00034
000014 000000 A                35         DATA    0                                                        00 00035
                               36         EXT     #MCI7A                                                   00 00036
000015 000000 E                37         DATA    #MCI7A                                                   00 00037
000016 000000 A                38         DATA    0,0,0                                                    00 00038
000017 000000 A
000020 000000 A
       000021 R                39 CTEND   EQU     *                                                        00 00039
                               40         END                                                              00 00040
ENTRY NAMES
000000 R CTCI7A
EXTERNAL NAMES
000011 E !BCI7A 000006 E #ACI7A 000007 E #DCI7A 000015 E #MCI7A
000000 E TBCI7A
SYMBOLS
000011 E !BCI7A 000006 E #ACI7A 000007 E #DCI7A 000015 E #MCI7A
000000 R CTCI7A 000021 R CTEND  000000 E TBCI7A
  0 ERRORS ASSEMBLY COMPLETE
```

```
                      1 *                                                                      02 00001
                      2 *        SUBROUTINE--CB2A                                              02 00002
                      3 *                                                                      02 00003
                      4 *        PURPOSE--TO CONVERT A BINARY NUMBER TO A PACKED ASCII         02 00004
                      5 *                 STRING, RIGHT JUSTIFIED, WITH BLANK FILL.            02 00005
                      6 *                 CONVERSION MAY BE EITHER DECIMAL OR OCTAL.           02 00006
                      7 *                                                                      02 00007
                      8 *        CALLING SEQUENCE                                              02 00008
                      9 *        JSR      CB2A,X                                               02 00009
                     10 *        DATA     ADDR OF BINARY NUMBER                                02 00010
                     11 *                                                                      02 00011
                     12 *       ENTRANCE PARAMETERS                                            02 00012
                     13 *        (A) EQ 0--OCTAL CONVERSION                                    02 00013
                     14 *        (A) NE 0--DECIMAL CONVERSION                                  02 00014
                     15 *                                                                      02 00015
                     16 *        EXIT PARAMETERS                                               02 00016
                     17 *        (A) = ADDR OF PACKED STRING                                   02 00017
                     18 *        (B) RESTORED                                                  02 00018
                     19 *                                                                      02 00019
       000001 A      20 X       EQU      1                                                     02 00020
       000002 A      21 B       EQU      2                                                     02 00021
       000425 A      22 BS4     EQU      0425                                                  02 00022
                     24         TITLE    CB2A                                                  02 00024
                     25         NAME     CB2A                                                  02 00025
       000000 R      26 CB2A    EQU      *                                                     02 00026
000000 074152 A      27         STX      CBA80       SAVE RETURN ADDRESS                       02 00027
000001 064153 A      28         STB      BSAVE                                                 02 00028
000002 025000 A      29         LDB      0,X         ADDR OF BINARY VALUE                      02 00029
000003 006477 A      30 CB2     BT+077   CB5         JUMP IF NOT AN INDIRECT POINTER           02 00030
000004 000000 A
000005 026000 A      31         LDB      0,B         FOLLOW INDIRECT CHAIN                     02 00031
000006 001000 A      32         JMP      CB2                                                   02 00032
000007 000003 R
000010 026000 A      33 CB5     LDB      0,B         GET BINARY VALUE                          02 00033
000011 005004 A      34         TZX                                                            02 00034
000012 074137 A      35         STX      CBA70       CLEAR ZERO SUPPRESS SWITCH                02 00035
000013 001010 A      36         JAZ      CBA20       JUMP IF OCTAL CONVERSION                  02 00036
000014 000077 R
                     37 *                                                                      02 00037
                     38 * DECIMAL CONVERSION                                                   02 00038
                     39 *                                                                      02 00039
000015 005021 A      40         TBA                                                            02 00040
000016 054137 A      41         STA      CBSGN       SAVE VALUE FOR SIGN FLAG                  02 00041
000017 001002 A      42         JAP      CBA5        IF A POSITIVE VALUE                       02 00042
000020 000023 R
000021 005211 A      43         CPA                                                            02 00043
000022 005111 A      44         IAR                  CONVERT TO A POSITIVE VALUE               02 00044
       000023 R      45 CBA5    EQU      *                                                     02 00045
000023 005012 A      46         TAB                                                            02 00046
000024 014127 A      47         LDA      N240                                                  02 00047
000025 054116 A      48         STA      CBA60       BLANK 1ST CHAR                            02 00048
000026 006030 A      49         LDXI     CBA50       (X) = POWER OF 10 TABLE ADDR              02 00049
000027 000137 R
                     50 *                                                                      02 00050
                     51 * DECIMAL CONVERSION LOOP                                              02 00051
                     52 *                                                                      02 00052
       000030 R      53 CBA10   EQU      *                                                     02 00053
000030 005001 A      54         TZA                                                            02 00054
000031 175000 A      55         DIV      0,X         GET DECIMAL DIGIT                         02 00055
000032 065006 A      56         STB      6,X         STORE                                     02 00056
000033 001020 A      57         JBZ      CBA15       JUMP IF TOO LARGE                         02 00057
000034 000037 R
000035 020425 A      58         LDB      BS4         SET ZERO SUPPRESS SWITCH                  02 00058
000036 064113 A      59         STB      CBA70                                                 02 00059
       000037 R      60 CBA15   EQU      *                                                     02 00060
000037 005012 A      61         TAB                  REMAINDER TO (B)                          02 00061
000040 015006 A      62         LDA      6,X                                                   02 00062
000041 124112 A      63         ADD      N240        CONVERT DIGIT TO ASCII                    02 00063
000042 124107 A      64         ADD      CBA70       SUPPRESS LEADING ZERUS                    02 00064
000043 055006 A      65         STA      6,X                                                   02 00065
000044 005145 A      66         INCR     045         BUMP POINTER                              02 00066
000045 006140 A      67         SUBI     CBA50+5                                               02 00067
000046 000144 R
000047 001004 A      68         JAN      CBA10       TEST CONVERSION FINISH                    02 00068
000050 000030 R
000051 014100 A      69         LDA      CBA70       ZERO SUPPRESS FLAG                        02 00069
000052 001016 A      70         JANZ     CBA15A      IF SET  (NON BLANK CHAR FOUND)            02 00070
000053 000057 R
000054 006010 A      71         LDAI     0260                                                  02 00071
000055 000260 A
000056 055005 A      72         STA      5,X         SET L.S. CHAR TO ZERO                     02 00072
       000057 R      73 CBA15A  EQU      *                                                     02 00073
000057 014076 A      74         LDA      CBSGN       SIGN FLAG                                 02 00074
000060 001002 A      75         JAP      CBA40       IF POSITIVE                               02 00075
000061 000115 R
000062 005042 A      76         TXB                                                            02 00076
       000063 R      77 CBA16   EQU      *                                                     02 00077
000063 016006 A      78         LDA      6,B         LEAST SIGNIFICANT DIGIT                   02 00078
000064 144067 A      79         SUB      N240                                                  02 00079
000065 001010 A      80         JAZ      CBA17       IF BLANK                                  02 00080
000066 000072 R
000067 005322 A      81         DBR                  SET FOR NEXT LEAST SIGNIFICANT DIGIT      02 00081
000070 001000 A      82         JMP      CBA16       CONTINUE SEARCH FOR BLANK                 02 00082
```

```
000071 000063 R
000072 006010 A    83 CBA17  LDAI    '-'          MINUS SIGN                              02 00083
000073 000255 A
000074 056006 A    84        STA     6,B          STORE MINUS SIGN IN STRING              02 00084
000075 001000 A    85        JMP     CBA40                                                02 00085
000076 000116 R
                   86 *                                                                    02 00086
                   87 * OCTAL CONVERSION                                                   02 00087
                   88 *                                                                    02 00088
       000077 R    89 CBA20  EQU     *                                                     02 00089
000077 006030 A    90        LDXI    CBA60-6      (X) = STRING POINTER                    02 00090
000100 000136 R
000101 004441 A    91        LLRL    1            ROTATE 1ST BIT INTO (A)                 02 00091
                   92 *                                                                    02 00092
                   93 * OCTAL CONVERSION LOOP                                             02 00093
                   94 *                                                                    02 00094
       000102 R    95 CBA30  EQU     *                                                     02 00095
000102 006120 A    96        ADDI    0260         CONVERT DIGIT TO ASCII                  02 00096
000103 000260 A
000104 055006 A    97        STA     6,X          STORE CHAR IN STRING                    02 00097
000105 003145 A    98        INCR    045          BUMP POINTER                            02 00098
000106 006140 A    99        SUBI    CBA60                                                02 00099
000107 000144 R
000110 001002 A   100        JAP     CBA40        JUMP IF 6 CHARS CONVERTED               02 00100
000111 000116 R
000112 005001 A   101        TZA                                                          02 00101
000113 004443 A   102        LLRL    3            SHIFT NEXT OCTAL DIGIT TO (A)           02 00102
000114 001000 A   103        JMP     CBA30        CONVERT NEXT CHAR                       02 00103
000115 000102 R
                  104 *                                                                    02 00104
                  105 * PACK CHARACTERS                                                   02 00105
                  106 *                                                                    02 00106
       000116 R   107 CBA40  EQU     *                                                     02 00107
000116 015000 A   108        LDA     0,X          DIGIT 1                                 02 00108
000117 004250 A   109        LRLA    8                                                    02 00109
000120 115001 A   110        ORA     1,X          DIGIT 2                                 02 00110
000121 055000 A   111        STA     0,X                                                  02 00111
000122 015002 A   112        LDA     2,X          DIGIT 3                                 02 00112
000123 004250 A   113        LRLA    8                                                    02 00113
000124 115003 A   114        ORA     3,X          DIGIT 4                                 02 00114
000125 055001 A   115        STA     1,X                                                  02 00115
000126 015004 A   116        LDA     4,X          DIGIT 5                                 02 00116
000127 004250 A   117        LRLA    8                                                    02 00117
000130 115005 A   118        ORA     5,X          DIGIT 6                                 02 00118
000131 055002 A   119        STA     2,X                                                  02 00119
000132 005041 A   120        TXA                                                          02 00120
000133 024021 A   121        LDB     BSAVE                                                02 00121
000134 034016 A   122        LDX     CBA80        RETURN ADDR                             02 00122
000135 006705 A   123        IJMP    1,X          RETURN                                  02 00123
000136 000001 A
000137 023420 A   124 CBA50  DATA    10000        POWER OF TEN TABLE                      02 00124
000140 001750 A   125        DATA    1000                                                 02 00125
000141 000144 A   126        DATA    100                                                  02 00126
000142 000012 A   127        DATA    10                                                   02 00127
000143 000001 A   128        DATA    1                                                    02 00128
000144            129 CBA60  BSS     6            WORKING STORAGE                         02 00129
000152            130 CBA70  BSS     1            ZERO SUPPRESS SWITCH                    02 00130
000153            131 CBA80  BSS     1            RETURN ADDRESS                          02 00131
000154 000240 A   132 N240   DATA    0240         ASCII BLANK                             02 00132
000155 000000 A   133 BSAVE  DATA    0                                                    02 00133
000156 000000 A   134 CBSGN  DATA    0            VALUE SIGN FLAG                         02 00134
                  135        END                                                          02 00135
ENTRY NAMES
000000 R CB2A
EXTERNAL NAMES
SYMBOLS
000002 A B       000425 A BS4     000155 R BSAVE   000003 R CB2
000000 R CB2A    000010 R CB5     000030 R CBA10   000037 R CBA15
000057 R CBA15A  000063 R CBA16   000072 R CBA17   000077 R CBA20
000102 R CBA30   000116 R CBA40   000023 R CBA5    000137 R CBA50
000144 R CBA60   000152 R CBA70   000153 R CBA80   000156 R CBSGN
000154 R N240    000001 A X
  0 ERRORS ASSEMBLY COMPLETE


  21  B          31    33    78    84
  22  BS4        58
 133  BSAVE      28   121
  30  CB2        32
  26  CB2A       24    25
  53  CBA10      68
  60  CBA15      57
  73  CBA15A     70
  77  CBA16      82
  83  CBA17      80
  89  CBA20      36
  95  CBA30     103
 107  CBA40      75    85   100
  45  CBA5       42
 124  CBA50      49    67
 129  CBA60      48    90    99
 130  CBA70      35    59    64    69
 131  CBA80      27   122
```

134	CBSGN	41	74							
132	N240	47	63	79						
20	X	29	55	56	62	65	72	97	108	110
		111	112	114	115	116	118	119	123	

```
                    1 *                                                                                 01 00001
                    2 *       SUBROUTINE--CA2B                                                          01 00002
                    3 *                                                                                 01 00003
                    4 *       PURPOSE--TO CONVERT A DECIMAL OR OCTAL ASCII NUMBER TO BINARY              01 00004
                    5 *                                                                                 01 00005
                    6 *       CALLING SEQUENCE                                                          01 00006
                    7 *                                                                                 01 00007
                    8 *       JSR     CA2B,X                                                            01 00008
                    9 *      DATA     ASCII STRING ADDR (COMPL=LEFT BYTE, POS=RIGHT)                    01 00009
                   10 *      DATA     ADDR OF TERMINATION CHAR BLOCK                                    01 00010
                   11 *                                                                                 01 00011
                   12 *       EXIT PARAMETERS                                                           01 00012
                   13 *                                                                                 01 00013
                   14 *       (A) = BINARY VALUE                                                        01 00014
                   15 *       (B) = NEXT BYTE ADDR                                                      01 00015
                   16 *       OVFL SET IF AN ILLEGAL CHAR ENCOUNTERED                                   01 00016
                   17 *                                                                                 01 00017
000001 A           18 X      EQU     1                                                                   01 00018
000002 A           19 B      EQU     2                                                                   01 00019
000471 A           20 TEN    EQU     0471                                                                01 00020
000463 A           21 RHW    EQU     0463                                                                01 00021
                   23        TITLE   CA2B                                                              01 00023
                   24        NAME    CA2B,FETCH                                                        01 00024
000000 R           25 CA2B   EQU     *                                                                   01 00025
000000 074165 A    26        STX     CAB90                                                             01 00026
000001 006010 A    27        LDAI    '8'                                                               01 00027
000002 000270 A
000003 054170 A    28        STA     MAX             SET FOR OCTAL CONVERSION                          01 00028
000004 015001 A    29        LDA     1,X             CHARACTER COUNT                                   01 00029
000005 054161 A    30        STA     CABTCB          TERM CHAR BLOCK ADDR                              01 00030
000006 005101 A    31        INCR    1                                                                 01 00031
000007 054161 A    32        STA     CASGN           SAVE VALUE FOR SETTING SIGN                       01 00032
000010 005002 A    33        TZB                                                                       01 00033
000011 035000 A    34        LDX     0,X                                                               01 00034
000012 R           35 CAB05  EQU     *                                                                 01 00035
000012 002000 A    36        CALL    FETCH           FETCH FIRST CHAR                                  01 00036
000013 000142 R
000014 005012 A    37        TAB                                                                       01 00037
000015 006140 A    38        SUBI    0255                                                              01 00038
000016 000255 A
000017 001016 A    39        JANZ    CAB07           IF POSITIVE NUMBER                                01 00039
000020 000024 R
000021 054147 A    40        STA     CASGN           SET FLAG AS A NEGATIVE NUMBER                     01 00040
000022 001000 A    41        JMP     CAB05                                                             01 00041
000023 000012 R
000024 006140 A    42 CAB07  SUBI    3                                                                 01 00042
000025 000003 A
000026 001010 A    43        JAZ     CAB020          JUMP IF OCTAL CONVERSION                          01 00043
000027 000064 R
000030 006010 A    44        LDAI    0272                                                              01 00044
000031 000272 A
000032 054141 A    45        STA     MAX             SET FOR DECIMAL CONVERSION                        01 00045
000033 005021 A    46        TBA                                                                       01 00046
000034 005002 A    47        TZB                                                                       01 00047
000035 001000 A    48        JMP     CAB012                                                            01 00048
000036 000041 R
000037 R           49 CAB010 EQU     *                                                                 01 00049
000037 002000 A    50        CALL    FETCH           FETCH 1 CHAR                                      01 00050
000040 000142 R
000041 R           51 CAB012 EQU     *                                                                 01 00051
000041 002000 A    52        CALL    TERM,CAB015     CHECK CHAR                                        01 00052
000042 000136 R
000043 000055 R
                   53 ****************************                                                    01 00053
                   54 * DECIMAL CONVERSION LOOP *                                                     01 00054
                   55 ****************************                                                    01 00055
000044 160471 A    56        MUL     TEN             CONVERT TO DECIMAL                                01 00056
000045 002000 A    57        CALL    FETCH           FETCH NEXT CHAR                                   01 00057
000046 000142 R
000047 002000 A    58        CALL    TERM,CAB015     CHECK CHAR                                        01 00058
000050 000136 R
000051 000055 R
000052 160471 A    59        MUL     TEN             CONVERT TO DECIMAL                                01 00059
000053 001000 A    60        JMP     CAB010                                                            01 00060
000054 000037 R
000055 R           61 CAB015 EQU     *                                                                 01 00061
000055 024113 A    62        LDB     CASGN           SIGN FLAG                                         01 00062
000056 001026 A    63        JBNZ    CAB50           IF POSITIVE                                       01 00063
000057 000161 R
000060 005211 A    64        CPA                                                                       01 00064
000061 005111 A    65        IAR                     SET VALUE NEGATIVE                                01 00065
000062 001000 A    66        JMP     CAB50                                                             01 00066
000063 000161 R
                   67 ************************                                                        01 00067
                   68 * OCTAL CONVERSION LOOP *                                                       01 00068
                   69 ************************                                                        01 00069
000064 R           70 CAB020 EQU     *                                                                 01 00070
000064 005002 A    71        TZB                                                                       01 00071
000065 002000 A    72        CALL    FETCH           FETCH NEXT CHAR                                   01 00072
000066 000142 R
000067 002000 A    73        CALL    TERM,CAB015     CHECK CHAR                                        01 00073
000070 000136 R
000071 000055 R
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000072 004043 A    74          LRLB    3                                                    01 00074
000073 005032 A    75          MERG    032             CONVERT TO OCTAL                     01 00075
000074 001000 A    76          JMP     CAB020+1                                             01 00076
000075 000065 R
                   77 *                                                                     01 00077
                   78 *        TERM--CHECK IF CHAR IS A LEGAL TERMINATOR CHAR            01 00078
                   79 *              SET OVFL IF ILLEGAL                                   01 00079
                   80 *                                                                     01 00080
000076 064073 A    81 TRM10    STB     TRB             SAVE B REG                           01 00081
000077 024066 A    82          LDB     CAB90                                                01 00082
000100 026001 A    83          LDB     1,B             TERM CHAR BLOCK ADDR                 01 00083
000101 016000 A    84 TRM20    LDA     0,B             TERM CHAR                            01 00084
000102 001010 A    85          JAZ     TRM30           IF END OF BLOCK                      01 00085
000103 000112 R
000104 144066 A    86          SUB     TRCHR           CURRENT CHAR                         01 00086
000105 001010 A    87          JAZ     TRM40           IF A TERMINATION CHAR                01 00087
000106 000126 R
000107 005122 A    88          IBR                                                          01 00088
000110 001000 A    89          JMP     TRM20           CHECK NEXT TERM CHAR                 01 00089
000111 000101 R
000112 014060 A    90 TRM30    LDA     - TRCHR         CURRENT CHAR                         01 00090
000113 144060 A    91          SUB     MAX                                                  01 00091
000114 001002 A    92          JAP     TRM50           IF AN ILLEGAL CHAR                   01 00092
000115 000133 R
000116 014054 A    93          LDA     TRCHR           CURRENT CHAR                         01 00093
000117 144050 A    94          SUB     N260                                                 01 00094
000120 001004 A    95          JAN     TRM50           IF ILLEGAL CHAR                      01 00095
000121 000133 R
000122 024047 A    96          LDB     TRB                                                  01 00096
000123 044012 A    97          INR     TERM            UPDATE RETURN                        01 00097
000124 001000 A    98          RETU*   TERM                                                 01 00098
000125 100136 R
000126 024007 A    99 TRM40    LDB     TERM                                                 01 00099
000127 026000 A   100          LDB     0,B                                                  01 00100
000130 014041 A   101          LDA     TRB                                                  01 00101
000131 006706 A   102          IJMP    0,B             TERM CHAR FOUND ADDR                 01 00102
000132 000000 A
000133 007401 A   103 TRM50    SOF                                                          01 00103
000134 001000 A   104          JMP     CAB50+1         INDICATE ILLEGAL CHAR AND EXIT       01 00104
000135 000162 R
000136 000000 A   105 TERM     ENTR                                                         01 00105
000137 054033 A   106          STA     TRCHR           SAVE CHAR                            01 00106
000140 001000 A   107          JMP     TRM10                                                01 00107
000141 000076 R
                   108 *                                                                    01 00108
                   109 *       FETCH--FETCH NEXT BYTE  (X=BYTE ADDR, LT 0=LEFT, GT 0=RIGHT) 01 00109
                   110 *              RETURN--(X) = NEXT BYTE ADDR, (A) = BYTE (RIGHT JUST) 01 00110
                   111 *                                                                    01 00111
000142 000000 A   112 FETCH    ENTR                                                         01 00112
000143 005041 A   113          TXA                                                          01 00113
000144 001004 A   114          JAN     FET10           IF LEFT BYTE                         01 00114
000145 000154 R
000146 015000 A   115          LDA     0,X                                                  01 00115
000147 150463 A   116          ANA     RHW             FETCH RIGHT BYTE                     01 00116
000150 005144 A   117          IXR                                                          01 00117
000151 005244 A   118          CPX                     SET FOR NEXT BYTE                    01 00118
000152 001000 A   119          RETU*   FETCH                                                01 00119
000153 100142 R
000154 005244 A   120 FET10    CPX                                                          01 00120
000155 015000 A   121          LDA     0,X                                                  01 00121
000156 004350 A   122          LSRA    8               FETCH LEFT BYTE                      01 00122
000157 001000 A   123          RETU*   FETCH                                                01 00123
000160 100142 R
000161 000161 R   124 CAB50    EQU     *                                                    01 00124
000161 007400 A   125          RDF                     CLEAR ERROR INDICATOR                01 00125
000162 044003 A   126          INR     CAB90                                                01 00126
000163 044002 A   127          INR     CAB90           UPDATE RETURN ADDR                   01 00127
000164 005042 A   128          TXB                     NEXT BYTE ADDR                       01 00128
000165 001000 A   129          JMP     0               RETURN                               01 00129
000166 000000 A
000166            130 CAB90    BES     0                                                    01 00130
000167 000000 A   131 CABTCB   DATA    0               TERM CHAR BLOCK ADDR                 01 00131
000170 000260 A   132 N260     DATA    0260                                                 01 00132
000171 000000 A   133 CASGN    DATA    0               SIGN FLAG                            01 00133
000172 000000 A   134 TRB      DATA    0                                                    01 00134
000173 000000 A   135 TRCHR    DATA    0               CURRENT CHAR                         01 00135
000174 000000 A   136 MAX      DATA    0               MAX NUMERIC CHAR+1 (SET BY CA2B)     01 00136
                   137          END                                                      01 00137
ENTRY NAMES
000000 R CA2B    000142 R FETCH
EXTERNAL NAMES
SYMBOLS
000002 A B       000000 R CA2B    000037 R CAB010  000041 R CAB012
000055 R CAB015  000064 R CAB020  000012 R CAB05   000024 R CAB07
000161 R CAB50   000166 R CAB90   000167 R CABTCB  000171 R CASGN
000154 R FET10   000142 R FETCH   000174 R MAX     000170 R N260
000463 A RHW     000471 A TEN     000136 R TERM    000172 R TRB
000173 R TRCHR   000076 R TRM10   000101 R TRM20   000112 R TRM30
000126 R TRM40   000133 R TRM50   000001 A X
  0 ERRORS ASSEMBLY COMPLETE


   19  B          83    84   100   102
```

25	CA2B	23	24					
49	CAB010	60						
51	CAB012	48						
61	CAB015	52	58	73				
70	CAB020	43	76					
35	CAB05	41						
42	CAB07	39						
124	CAB50	63	66	104				
130	CAB90	26	82	126	127			
131	CABTCB	30						
133	CASGN	32	40	62				
120	FET10	114						
112	FETCH	24	36	50	57	72	119	123
136	MAX	28	45	91				
132	N260	94						
21	RHW	116						
20	TEN	56	59					
105	TERM	52	58	73	97	98	99	
134	TRB	81	96	101				
135	TRCHR	86	90	93	106			
81	TRM10	107						
84	TRM20	89						
90	TRM30	85						
99	TRM40	87						
103	TRM50	92	95					
18	X	29	34	115	121			

```
                                1 *                                                                                  00 00001
                                2 *       SUBROUTINE--MOVE                                                           00 00002
                                3 *                                                                                  00 00003
                                4 *       PURPOSE--TO MOVE A BLOCK OF N WORDS FROM ADDR F TO ADDR T                  00 00004
                                5 *                                                                                  00 00005
                                6 *       CALLING SEQUENCE                                                           00 00006
                                7 *                                                                                  00 00007
                                8 *       JSR     MOVE,X                                                           00 00008
                                9 *       DATA    N                                                                00 00009
                               10 *       DATA    F                                                                00 00010
                               11 *       DATA    T                                                                00 00011
                               12 *                                                                                  00 00012
                               13 *       EXIT PARAMETERS                                                          00 00013
                               14 *       (A) AND (B) RESTORED                                                     00 00014
                               15 *                                                                                  00 00015
000001 A                       16 X       EQU     1                                                                00 00016
000002 A                       17 B       EQU     2                                                                00 00017
                               19         TITLE   MOVE                                                             00 00019
                               20         NAME    MOVE                                                             00 00020
000000 R                       21 MOVE    EQU     *                                                                00 00021
000000 074055 A                22         STX     MOV50          SAVE RETURN ADDRESS                               00 00022
000001 054055 A                23         STA     ASAVE                                                            00 00023
000002 064055 A                24         STB     BSAVE                                                            00 00024
000003 015000 A                25         LDA     0,X            GET COUNT                                         00 00025
000004 005211 A                26         CPA                                                                      00 00026
000005 005111 A                27         IAR                    (A) = -(A)                                        00 00027
000006 004241 A                28         LRLA    1                                                                00 00028
000007 004341 A                29         LSRA    1              CLEAR SIGN                                        00 00029
000010 054044 A                30         STA     MOV40          SAVE AS LOOP COUNT                                00 00030
000011 015001 A                31         LDA     1,X            GET F ADDRESS                                     00 00031
000012 145002 A                32         SUB     2,X            - T ADDRESS                                       00 00032
000013 001004 A                33         JAN     MOV20          JUMP IF REVERSE MOVE                              00 00033
000014 000032 R
000015 025001 A                34         LDB     1,X            (B) = F ADDRESS                                   00 00034
000016 035002 A                35         LDX     2,X            (X) = T ADDRESS                                   00 00035
000017 007400 A                36         RDF                    CLEAR LOOP END FLAG                               00 00036
                               37 *                                                                                  00 00037
                               38 * MOVE FORWARD                                                                    00 00038
                               39 *                                                                                  00 00039
000020 R                       40 MOV10   EQU     *                                                                00 00040
000020 016000 A                41         LDA     0,B            GET WORD                                          00 00041
000021 055000 A                42         STA     0,X            STORE WORD                                        00 00042
000022 005122 A                43         IBR                    BUMP POIMTERS                                     00 00043
000023 005144 A                44         IXR                                                                      00 00044
000024 044030 A                45         INR     MOV40          BUMP LOOP COUNT                                   00 00045
000025 001007 A                46         JOFN    MOV10          MOVE NEXT WORD                                    00 00046
000026 000020 R
000027 034026 A                47         LDX     MOV50          GET RETURN ADDRESS                                00 00047
000030 006705 A                48         IJMP    3,X            RETURN                                            00 00048
000031 000003 A
                               49 *                                                                                  00 00049
                               50 * MOVE REVERSE                                                                    00 00050
                               51 *                                                                                  00 00051
000032 R                       52 MOV20   EQU     *                                                                00 00052
000032 015001 A                53         LDA     1,X            GET F ADDRESS                                     00 00053
000033 125000 A                54         ADD     0,X            ADD COUNT                                         00 00054
000034 005012 A                55         TAB                                                                      00 00055
000035 015002 A                56         LDA     2,X            GET T ADDRESS                                     00 00056
000036 125000 A                57         ADD     0,X            ADD COUNT                                         00 00057
000037 005014 A                58         TAX                                                                      00 00058
000040 007400 A                59         RDF                    CLEAR LOOP END FLAG                               00 00059
000041 R                       60 MOV30   EQU     *                                                                00 00060
000041 005322 A                61         DBR                    BUMP POINTERS                                     00 00061
000042 005344 A                62         DXR                                                                      00 00062
000043 016000 A                63         LDA     0,B            GET WORD                                          00 00063
000044 055000 A                64         STA     0,X            STORE WORD                                        00 00064
000045 044007 A                65         INR     MOV40          BUMP LOOP COUNT                                   00 00065
000046 001007 A                66         JOFN    MOV30          MOVE NEXT WORD                                    00 00066
000047 000041 R
000050 014006 A                67         LDA     ASAVE                                                           00 00067
000051 024006 A                68         LDB     BSAVE                                                           00 00068
000052 034003 A                69         LDX     MOV50          GET RETURN ADDRESS                                00 00069
000053 006705 A                70         IJMP    3,X            RETURN                                            00 00070
000054 000003 A
000055                         71 MOV40   BSS     1              LOOP COUNT                                        00 00071
000056                         72 MOV50   BSS     1              RETURN ADDRESS                                    00 00072
000057 000000 A                73 ASAVE   DATA    0                                                                00 00073
000060 000000 A                74 BSAVE   DATA    0                                                                00 00074
                               75         END                                                                      00 00075
ENTRY NAMES
000000 R MOVE
EXTERNAL NAMES
SYMBOLS
000057 R ASAVE   000002 A B      000060 R BSAVE   000020 R MOV10
000032 R MOV20   000041 R MOV30  000055 R MOV40   000056 R MOV50
000000 R MOVE    000001 A X
   0 ERRORS ASSEMBLY COMPLETE

    73  ASAVE       23      67
    17  B           41      63
    74  BSAVE       24      68
    40  MOV10       46
```

52	MOV20	33								
60	MOV30	66								
71	MOV40	30	45	65						
72	MOV50	22	47	69						
21	MOVE	19	20							
16	X	25	31	32	34	35	42	48	53	54
		56	57	64	70					

```
                                                
```

```
000105 135315 A
000106 146672 A
000107 151723 A
000110 127315 A
000111 146715 A
                    80          END                                                    00 00080
ENTRY NAMES
000000 R CTIME
EXTERNAL NAMES
000000 E V$EXEC
SYMBOLS
000002 A B        000102 R BSAVE   000104 R CTBLK   000000 R CTIME
000046 R CTM10    000466 A SIX     000471 A TEN     000101 R TIMS
000000 E V$EXEC   000001 A X       000103 R XSAVE
  0 ERRORS ASSEMBLY COMPLETE

    77   BSAVE      22     72
    79   CTBLK      30     34     40     47     55     56     63     70     71
    21   CTIME      15     16
    54   CTM10      39
    19   SIX        32
    20   TEN        27     36
    76   TIMS       25     41     44     48     51     58     60     65
    17   X          74
    78   XSAVE      23     73
```

```
                                                
```

```
000001 A      1 VORTEX SET     1                                                                  00 00001
              3         TITLE   $6E                                                               00 00003
              5 ***************************************************************************      00 00005
              6 *                                                                         *      00 00006
              7 *     D P   I N T E G E R   T O   D P   I N T E G E R   P O W E R       *      00 00007
              8 *                                                                         *      00 00008
              9 *                              ( $ 6 E )                                  *      00 00009
             10 *                                                                         *      00 00010
             11 * FUNCTION: TO CALCULATE DP1**DP2, DP1 AND DP2 DP INTEGERS               *      00 00011
             12 *                                                                         *      00 00012
             13 * ENTRY: AB=DP1                                                           *      00 00013
             14 *                                                                         *      00 00014
             15 * CALLING SEQUENCE: JMPM $6E                                            *      00 00015
             16 *                    DATA DP2                                             *      00 00016
             17 *                                                                         *      00 00017
             18 * EXIT : AB=DP1**DP2                                                     *      00 00018
             19 *        X SAVED                                                          *      00 00019
             20 *                                                                         *      00 00020
             21 * ERRORS: OVFL SET                                                       *      00 00021
             22 *                                                                         *      00 00022
             23 *        AB=MAX DP INTEGER OF CORRECT SIGN                                *      00 00023
             24 *                                                                         *      00 00024
             25 ***************************************************************************      00 00025
             27 ***********                                                                      00 00027
             28 * ENTRIES *                                                                     00 00028
             29 ***********                                                                      00 00029
             31         NAME    $6E                                                           00 00031
             33 *************                                                                    00 00033
             34 * EXTERNALS *                                                                  00 00034
             35 *************                                                                    00 00035
             37         IFF     VORTEX-4                                                      00 00037
             38         GOTO    FRMWR2                                                        00 00038
             39         IFF     VORTEX-2                                                      00 00039
             40         GOTO    FRMWR1                                                        00 00040
             41         EXT     $SE             SOFTWARE PARAMETER XFER                       00 00041
             42 FRMWR1  CONT                                                                  00 00042
             43         EXT     $6M             SOFTWARE DP INTEGER MULTIPLY                  00 00043
             44 FRMWR2  CONT                                                                  00 00044
             46 *************                                                                  00 00046
             47 * SET BLOCK *                                                                 00 00047
             48 *************                                                                  00 00048
000040  A    50 ARST    SET     040             TEST A-REG BIT SET                            00 00050
000000  A    51 B0      SET     0               BIT 0                                         00 00051
000420  A    52 MT      SET     0420                                                          00 00052
000421  A    53 BS0     SET     MT+1                                                          00 00053
000460  A    54 BR15    SET     MT+32                                                         00 00054
000440  A    55 BS15    SET     MT+16                                                         00 00055
000001  A    56 X       SET     1               X-REGISTER                                    00 00056
             58 **********                                                                   00 00058
             59 * MACROS *                                                                   00 00059
             60 **********                                                                   00 00060
             62 DIM     MAC                                                                  00 00062
             63         IFF     VORTEX-4                                                     00 00063
             64         GOTO    FRMWR1                                                       00 00064
             65         CALL    $6M             SOFTWARE DP INTEGER MULTIPLY                 00 00065
             66         DATA    P(1)                                                         00 00066
             67         GOTO    FRMWR2                                                       00 00067
             68 FRMWR1  CONT                                                                 00 00068
             69         DATA    0105227         BCS DP INTEGER MULTIPLY                      00 00069
             70         DATA    P(1)                                                         00 00070
             71 FRMWR2  CONT                                                                 00 00071
             72         EMAC                                                                 00 00072
             74 FSE     MAC                                                                  00 00074
             75         IFT     VORTEX-2                                                     00 00075
             76         IFF     VORTEX-4                                                     00 00076
             77         GOTO    FRMWR1                                                       00 00077
             78         CALL    $SE                                                          00 00078
             79         GOTO    FRMWR2                                                       00 00079
             80 FRMWR1  CONT                                                                 00 00080
             81         DATA    0105036         BCS PARAMETER XFER                           00 00081
             82 FRMWR2  CONT                                                                 00 00082
             83         EMAC                                                                 00 00083
             85 LDAB    MAC                                                                  00 00085
             86         IFT     VORTEX-2                                                     00 00086
             87         IFF     VORTEX-4                                                     00 00087
             88         GOTO    FRMWR1                                                       00 00088
             89         LDA     P(1)                                                         00 00089
             90         LDB     P(1)+1                                                       00 00090
             91         GOTO    FRMWR2                                                       00 00091
             92 FRMWR1  CONT                                                                 00 00092
             93         DATA    0105032         BCS LOAD AB                                  00 00093
             94         DATA    P(1)                                                         00 00094
             95 FRMWR2  CONT                                                                 00 00095
             96         EMAC                                                                 00 00096
             98 LDABD1  MAC                                                                  00 00098
             99         TZA                                                                  00 00099
            100         INCR    2                                                            00 00100
            101         EMAC                                                                 00 00101
            103 LDABX   MAC                                                                  00 00103
            104         LDA     P(1),X                                                       00 00104
            105         LDB     P(1)+1,X                                                     00 00105
            106         EMAC                                                                 00 00106
            108 MOVPAP  MAC                                                                  00 00108
```

```
                      109          IFT     VORTEX-2                                      00 00109
                      110          IFF     VORTEX-4                                      00 00110
                      111          GOTO    FRMWR1                                        00 00111
                      112          LDA     P(1)                                          00 00112
                      113          STA     P(2)                                          00 00113
                      114          GOTO    FRMWR2                                        00 00114
                      115 FRMWR1   CONT                                                  00 00115
                      116          DATA    0105037     WCS 2 WORD MOVE AB                00 00116
                      117          DATA    P(1)                                          00 00117
                      118          DATA    P(2)                                          00 00118
                      119 FRMWR2   CONT                                                  00 00119
                      120          EMAC                                                  00 00120
                      122 STAB     MAC                                                   00 00122
                      123          IFT     VORTEX-2                                      00 00123
                      124          IFF     VORTEX-4                                      00 00124
                      125          GOTO    FRMWR1                                        00 00125
                      126          STA     P(1)                                          00 00126
                      127          STB     P(1)+1                                        00 00127
                      128          GOTO    FRMWR2                                        00 00128
                      129 FRMWR1   CONT                                                  00 00129
                      130          DATA    0105033     BCS STORE AB                      00 00130
                      131          DATA    P(1)                                          00 00131
                      132 FRMWR2   CONT                                                  00 00132
                      133          EMAC                                                  00 00133
                      135 TEQ1AP   MAC                                                   00 00135
                      136          LDA     P(1)                                          00 00136
                      137          DAR                                                   00 00137
                      138          JAZ     P(2)                                          00 00138
                      139          EMAC                                                  00 00139
                      141 TGEAP    MAC                                                   00 00141
                      142          LDA     P(1)                                          00 00142
                      143          SUB     P(2)                                          00 00143
                      144          JAP     P(3)                                          00 00144
                      145          EMAC                                                  00 00145
                      147 TNAP     MAC                                                   00 00147
                      148          LDA     P(1)                                          00 00148
                      149          JAN     P(2)                                          00 00149
                      150          EMAC                                                  00 00150
                      152 TNZAP    MAC                                                   00 00152
                      153          LDA     P(1)                                          00 00153
                      154          JANZ    P(2)                                          00 00154
                      155          EMAC                                                  00 00155
                      157 TPAP     MAC                                                   00 00157
                      158          LDA     P(1)                                          00 00158
                      159          JAP     P(2)                                          00 00159
                      160          EMAC                                                  00 00160
                      162 TRAP     MAC                                                   00 00162
                      163          LDA     P(1)                                          00 00163
                      164          BT      ARST+P(2),P(3)                                00 00164
                      165          EMAC                                                  00 00165
                      167 **********************                                         00 00167
                      168 * STORE OPS LOCALLY *                                          00 00168
                      169 **********************                                         00 00169
                      171 E66      STAB    OP1         SAVE OP1/INITIALIZE P=OP1**1      00 00171
000000 054174 A
000001 064174 A
000002 054174 A       172          STA     OP1SGF      SAVE OP1 SIGN                     00 00172
000003 034160 A       173          LDX     E66PT       POINT X AT OP2                    00 00173
                      175          LDABX   0           GET OP2                           00 00175
000004 015000 A
000005 025001 A
                      176          STAB    OP2         SAVE OP2/SET E=OP2(2)             00 00176
000006 054171 A
000007 064171 A
000010 064171 A       177          STB     OP2OEF      SAVE OP2 ODD/EVEN FLAG            00 00177
                      178 *************************************                          00 00178
                      179 * TEST FOR SPECIAL VALUES OF OPS *                             00 00179
                      180 *************************************                          00 00180
000011 005031 A       182          MERG    031                                           00 00182
000012 114162 A       183          ORA     OP1                                           00 00183
000013 114162 A       184          ORA     OP1+1                                         00 00184
000014 001010 A       185          JAZ     E66EON      0**0 = ERROR                      00 00185
000015 000121 R
000016 005021 A       186          TBA                                                   00 00186
000017 114160 A       187          ORA     OP2                                           00 00187
000020 001010 A       188          JAZ     E66ONE      I**0 = 1                          00 00188
000021 000143 R
000022 014152 A       189          LDA     OP1                                           00 00189
000023 114152 A       190          ORA     OP1+1                                         00 00190
000024 001016 A       191          JANZ    E661        OP1=0 ?                           00 00191
000025 000033 R
                      192          TNAP    OP2,E66020  YES. 0**(-I) = OVFL               00 00192
000026 014151 A
000027 001004 A
000030 000137 R
000031 001000 A       193          JMP     E66ZER      0**( I) = 0                       00 00193
000032 000147 R
                      194 E661     TNZAP   OP1,E662    OP1(1)=0 ?                        00 00194
000033 014141 A
000034 001016 A
000035 000042 R
                      195          TEQ1AP  OP1+1,E66ONE  YES. 1**(I) = 1                 00 00195
000036 014137 A
```

```
000037 005311 A
000040 001010 A
000041 000143 R
                196 E662    TNAP    OP2,E66ZER     I**(-J) = 0                                  00 00196
000042 014135 A
000043 001004 A
000044 000147 R
000045 001016 A 197         JANZ    E6602          OVFL IF OP2(1) .NE. ZERO                     00 00197
000046 000125 R
                198         TGEAP   OP2+1,KD30,E6602D  OVERFLOW IF OP2 .GE. 30                  00 00198
000047 014131 A
000050 144123 A
000051 001002 A
000052 000137 R
                199 **********************                                                       00 00199
                200 * EXPONENTIAL LOOP *                                                        00 00200
                201 **********************                                                       00 00201
                203         MOVPAP  BR15,E66CNT    INITIALIZE LOOP COUNT                        00 00203
000053 010460 A
000054 054113 A
                204 E66L    TRAP    E66E,B0,E66LX     IS EXPONENT BIT SET ?                     00 00204
000055 014123 A
000056 006440 A
000057 000075 R
                205         LDAB    E66P           YES                                          00 00205
000060 014114 A
000061 024114 A
000062 007400 A 206         ROF                                                                 00 00206
000063 044104 A 207         INR     E66CNT         BUMP COUNT                                   00 00207
000064 001001 A 208         JOF     E66L1          SKIP MULTIPLY BY 1 ON 1ST LOOP               00 00208
000065 000073 R
                209         DIM     E66V           SET V=V*P                                    00 00209
000066 002000 A
000067 000000 E
000070 000172 R
000071 001001 A 210         JOF     E6602          OVERFLOW ?                                   00 00210
000072 000125 R
                211 E66L1   STAB    E66V           NO                                           00 00211
000073 054076 A
000074 064076 A
000075 014103 A 212 E66LX   LDA     E66E                                                        00 00212
000076 004341 A 213         LSRA    1                                                           00 00213
000077 054101 A 214         STA     E66E           GET NEXT BIT OF E                            00 00214
000100 001010 A 215         JAZ     E66LY          FINISHED ?                                   00 09215
000101 000115 R
                216         LDAB    E66P           NO                                           00 00216
000102 014072 A
000103 024072 A
                217         DIM     E66P           SET P=P**2                                   00 00217
000104 002000 A
000105 000067 E
000106 000175 R
000107 001001 A 218         JOF     E6602          OVERFLOW ?                                   00 00218
000110 000125 R
                219         STAB    E66P           NO                                           00 00219
000111 054063 A
000112 064063 A
000113 001000 A 220         JMP     E66L           LOOP TILL DONE                               00 00220
000114 000055 R
                221 E66LY   LDAB    E66V           EXIT WITH AB=V                               00 00221
000115 014054 A
000116 024054 A
000117 001000 A 222         JMP     E66Y           TAKE OK EXIT                                 00 00222
000120 000155 R
                223 ***************                                                             00 00223
                224 * 0**0 ERROR *                                                             00 00224
                225 ***************                                                             00 00225
                227 E66EON LDABD1                  SET AB=1                                     00 00227
000121 005001 A
000122 005102 A
000123 001000 A 228         JMP     E66X           TAKE ERROR EXIT                              00 00228
000124 000152 R
                229 ********************                                                        00 00229
                230 * OP2 OVERFLOW *                                                           00 00230
                231 ********************                                                        00 00231
                233 E6602   TRAP    OP1SGF,E66020     IS OP1 NEGATIVE ?                         00 00233
000125 014051 A
000126 001002 A
000127 000137 R
                234         TRAP    OP2DEF,B0,E66020     YES. IS OP2 ODD ?                     00 00234
000130 014051 A
000131 006440 A
000132 000137 R
000133 010440 A 235         LDA     BS15           YES                                          00 00235
000134 005102 A 236         INCR    2              LOAD MAX NEG NUMBER                          00 00236
000135 001000 A 237         JMP     E66X           TAKE ERROR EXIT                              00 00237
000136 000152 R
                238 ************************                                                    00 00238
                239 * 0**(-I) OVERFLOW *                                                       00 00239
                240 ************************                                                    00 00240
000137 010460 A 242 E66020 LDA      BR15           LOAD AB WITH MAX POSITIVE NUMBER             00 00242
000140 005012 A 243         TAB                                                                 00 00243
000141 001000 A 244         JMP     E66X           TAKE ERROR EXIT                              00 00244
```

```
000142 000152 R
                    245 ********************                                                    00 00245
                    246 * RETURN 1 VALID *                                                    00 00246
                    247 ********************                                                    00 00247
                    249 E66ONE LDABD1                  SET AB=1                              00 00249
000143 005001 A
000144 005102 A
000145 001000 A     250        JMP     E66Y            TAKE OK EXIT                          00 00250
000146 000155 R
                    251 ************************                                            00 00251
                    252 * RETURN ZERO VALID *                                              00 00252
                    253 ************************                                            00 00253
000147 005003 A     255 E66ZER ZERO    3               ZERO AB                               00 00255
000150 001000 A     256        JMP     E66Y            TAKE OK EXIT                          00 00256
000151 000155 R
                    257 ****************                                                    00 00257
                    258 * INVALID EXIT *                                                   00 00258
                    259 ****************                                                    00 00259
000152 007401 A     261 E66X   SOF                     SET OVFL TO FLAG ERROR                00 00261
000153 001000 A     262        JMP     E66Z                                                  00 00262
000154 000156 R
                    263 **************                                                      00 00263
                    264 * VALID EXIT *                                                     00 00264
                    265 **************                                                      00 00265
000155 007400 A     267 E66Y   ROF                     RESET OVFL TO FLAG RESULT OK          00 00267
000156 034012 A     269 E66Z   LDX     E66SVX          RESTORE X                             00 00269
000157 001000 A     270        JMP     0               EXIT                                  00 00270
000160 000000 A
                    271 *********                                                           00 00271
                    272 * ENTRY *                                                          00 00272
                    273 *********                                                           00 00273
000160              275 $6E    BES     0                                                     00 00275
                    276        ESE                     XFER PARAMETERS                       00 00276
000161 002000 A
000162 000000 E
000163 000001 A     277        DATA    1                                                     00 00277
000164              278 E66PT  BSS     1               POINTER TO OP2                        00 00278
000165 074003 A     279        STX     E66SVX          SAVE X                                00 00279
000166 001000 A     280        JMP     E66             JUMP BACK FOR FORWARD REF             00 00280
000167 000000 R
000170 000000 A     281 E66CNT DATA    0               LOOP COUNT                            00 00281
000171 000000 A     282 E66SVX DATA    0               SAVE X-REG                            00 00282
000172 000000 A     283 E66V   DATA    0,0             CURRENT VALUE                         00 00283
000173 000000 A
000174 000036 A     284 KD30   DATA    30                                                    00 00284
000175 000000 A     285 OP1    DATA    0,0             OP1                                   00 00285
000176 000000 A
       000175 R     286 E66P   EQU     OP1             POWER: P = OP1**(2**I)                00 00286
000177 000000 A     287 OP1SGF DATA    0               OP1 SIGN FLAG                         00 00287
000200 000000 A     288 OP2    DATA    0,0             OP2                                   00 00288
000201 000000 A
       000201 R     289 E66E   EQU     OP2+1           CURRENT EXPONENT                      00 00289
000202 000000 A     290 OP2OEF DATA    0               OP2 ODD/EVEN FLAG                     00 00290
                    291        END                                                           00 00291
ENTRY NAMES
000160 R $6E
EXTERNAL NAMES
000105 E $6M        000162 E $SE
SYMBOLS
000160 R $6E        000105 E $6M        000162 E $SE        000040 A ARST
000000 A B0         000460 A BR15       000421 A BS0        000440 A BS15
000000 R E66        000033 R E661       000042 R E662       000170 R E66CNT
000201 R E66E       000121 R E66EON     000055 R E66L       000073 R E66L1
000075 R E66LX      000115 R E66LY      000120 R E66O2       000137 R E66OP0
000143 R E66ONE     000175 R E66P       000164 R E66PT      000171 R E66SVX
000172 R E66V       000157 R E66X       000155 R E66Y       000156 R E662
000147 R E66ZER     000174 R KD30       000420 A MT         000175 R OP1
000177 R OP1SGF     000200 R OP2        000202 R OP2OEF     000001 A VORTEX
000001 A X
   0 ERRORS ASSEMBLY COMPLETE

  275   $6E          3     31
    0   $6M         43     65
    0   $SE         41     78
   50   ARST       164
   51   B0         204    234
   54   BR15       203    242
   55   BS15       235
  171   E66        280
  194   E661       191
  196   E662       194
  281   E66CNT     203    207
  289   E66E       204    212    214
  227   E66EON     185
  204   E66L       220
  211   E66L1      208
  212   E66LY      204
  221   E66LY      215
  233   E66O2      197    210    218
  242   E66O20     192    198    233    234
  249   E66ONE     188    195
  286   E66P       205    216    217    219
```

278	E66PT	173							
282	E66SVX	269	279						
283	E66V	209	211	221					
261	E66X	228	237	244					
267	E66Y	222	250	256					
269	E66Z	262							
255	E66ZER	193	196						
42	FRMWR1	40	64	77	88	111	125		
44	FRMWR2	38	67	79	91	114	128		
284	KD30	198							
52	MT	53	54	55					
285	OP1	171	183	194	189	190	194	195	286
287	OP1SGF	172	233						
288	OP2	176	187	192	196	198	289		
290	OP2DEF	177	234						
0	P	66	70	89	90	94	104	105	112
		117	118	126	127	131	136	138	142
		144	148	149	153	154	158	159	163
		164							
1	VORTEX	37	39	63	75	76	86	87	109
		123	124						
56	X	104	105						

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             3         TITLE   $FC                                                               00 00003
             5 ************************************************************************         00 00005
             6 *                                                                      *         00 00006
             7 *          F I X   R E A L   T O   D P   I N T E G E R ( $ F C )       *         00 00007
             8 *                                                                      *         00 00008
             9 * FUNCTION: TO FIX A REAL R TO A DP INTEGER I                          *         00 00009
            10 *                                                                      *         00 00010
            11 * ENTRY: AB = R                                                        *         00 00011
            12 *                                                                      *         00 00012
            13 * CALLING SEQUENCE:  JMPM $FC     CONVERT                             *         00 00013
            14 *                                                                      *         00 00014
            15 *                    'JMPM $HS2   CONVERT/STORE IN DP                 *         00 00015
            16 *                     DATA DP                                          *         00 00016
            17 *                                                                      *         00 00017
            18 * EXIT : AB = I                                                       *         00 00018
            19 *        DP = I IF $HS2 ENTRY                                          *         00 00019
            20 *                                                                      *         00 00020
            21 * ERRORS: OVERFLOW: OVFL SET                                          *         00 00021
            22 *                    AB = MAX DP INTEGER OF CORRECT SIGN               *         00 00022
            23 *                    $EE CALLED TO OUTPUT ' ARITH OVFL'                *         00 00023
            24 *                                                                      *         00 00024
            25 ************************************************************************         00 00025
            27 ***********                                                                      00 00027
            28 * ENTRIES *                                                                      00 00028
            29 ***********                                                                      00 00029
            31          NAME    $FC             CONVERT ENTRY                                00 00031
            32          NAME    $HS2            CONVERT/STORE ENTRY                          00 00032
            34 *************                                                                    00 00034
            35 * EXTERNALS *                                                                   00 00035
            36 *************                                                                    00 00036
            38          EXT     $EE             ERROR MESSAGE PROCESSOR                      00 00038
            39          IFT     VORTEX-2                                                     00 00039
            40          IFF     VORTEX-4                                                     00 00040
            41          GOTO    FRMWR1                                                       00 00041
            42          EXT     $SE             SOFTWARE PARAMETER XFER                      00 00042
            43 FRMWR1   CONT                                                                 00 00043
            44          EXT     XDCU            NEGATE AB                                    00 00044
            46 *************                                                                  00 00046
            47 * SET BLOCK *                                                                  00 00047
            48 *************                                                                  00 00048
000420 A    50 MT       SET     0420                                                         00 00050
000475 A    51 BM177    SET     MT+45                                                        00 00051
000460 A    52 BR15     SET     MT+32                                                        00 00052
000430 A    53 BS7      SET     MT+8                                                         00 00053
000430 A    54 D200     SET     $S7                                                          00 00054
000470 A    55 NINE     SET     MT+40                                                        00 00055
000001 A    56 X        SET     1               X-REGISTER                                   00 00056
            58 **********                                                                   00 00058
            59 * MACROS *                                                                   00 00059
            60 **********                                                                   00 00060
            62 FSE      MAC                                                                  00 00062
            63          IFT     VORTEX-2                                                     00 00063
            64          IFF     VORTEX-4                                                     00 00064
            65          GOTO    FRMWR1                                                       00 00065
            66          CALL    $SE             SOFTWARE PARAMETER XFER                      00 00066
            67          GOTO    FRMWR2                                                       00 00067
            68 FRMWR1   CONT                                                                 00 00068
            69          DATA    0105036         BCS PARAMETER XFER                           00 00069
            70 FRMWR2   CONT                                                                 00 00070
            71          EMAC                                                                 00 00071
            73 STRBX    MAC                                                                  00 00073
            74          STA     R(1),X                                                       00 00074
            75          STB     R(1)+1,X                                                     00 00075
            76          EMAC                                                                 00 00076
            78 ************************                                                     00 00078
            79 * TEST FOR NEGATIVE/ZERO *                                                    00 00079
            80 ************************                                                     00 00080
000000 005004 A     82 C06      TZX             CLEAR SIGN FLAG                              00 00082
000001 001002 A     83          JAP     *+4     IS R NEGATIVE ?                              00 00083
000002 000005 R
000003 005211 A     84          CPA             YES. GET ABS VALUE                           00 00084
000004 005304 A     85          DECR    4       SET SIGN FLAG                                00 00085
000005 074110 A     86          STX     C36SGF  STORE SIGN FLAG                              00 00086
000006 054104 A     87          STA     C36RH   SAVE R(1)                                    00 00087
000007 004347 A     88          LSRA    7       GET EXPONENT                                 00 00088
000010 140430 A     89          SUB     D200    SUBTRACT OFF BIAS                            00 00089
000011 054100 A     90          STA     C36E    SAVE                                         00 00090
000012 014102 A     91          LDA     C36RH   RESTORE R(1) IN A                            00 00091
000013 150475 A     92          ANA     BM177   CLEAR EXPONENT FIELD                         00 00092
000014 054100 A     93          STA     C36RH                                                00 00093
000015 005031 A     94          MERG    0,1                                                  00 00094
000016 001010 A     95          JAZ     C36Y    R = 0.0 ?                                    00 00095
000017 000046 R
000020 014071 A     96          LDA     C36C    NO. GET EXPONENT                             00 00096
000021 005311 A     97          DAR                                                          00 00097
000022 001004 A     98          JAN     C36ZER  I = 0 IF ABS(R) .LT. 1.0                     00 00098
000023 000064 R
000024 144074 A     99          SUB     D30                                                  00 00099
000025 001002 A    100          JAP     C36OVF  OVERFLOW IF EXPONENT .GT. 30                 00 00100
000026 000067 R
000027 120470 A    101          ADD     NINE                                                 00 00101
000030 034051 A    102          LDX     C36OLS                                               00 00102
```

```
000031 001002 A  103          JAP     C362          LEFT SHIFT ?                                  00 00103
000032 000036 R
000033 034055 A  104          LDX     C36ARS        NO. RIGHT                                     00 00104
000034 005211 A  105          CPA                   GET POSITIVE SHIFT COUNT                      00 00105
000035 005111 A  106          IAR                                                                 00 00106
000036 005051 A  107 C362     MERG    051           CONSTRUCT SHIFT INSTRUCTION                   00 00107
000037 054057 A  108          STA     C36SHF        STORE                                         00 00108
000040 014054 A  109          LDA     C36RH         RESTORE R(1) IN A                             00 00109
000041 003000 A  110          XEC     C36SHF        EXECUTE SHIFT                                 00 00110
000042 000117 R
000043 034052 A  111          LDX     C36SGF                                                      00 00111
000044 002046 A  112          JXNZM   XDCO          NEGATE AB IF SIGN FLAG SET                    00 00112
000045 000000 E
                 113 **************                                                               00 00113
                 114 * VALID EXIT *                                                              00 00114
                 115 **************                                                               00 00115
000046 007400 A  117 C36Y     RDF                   RESET OVFL TO FLAG OK                         00 00117
                 119 *********                                                                   00 00119
                 120 * EXIT *                                                                    00 00120
                 121 *********                                                                   00 00121
000047 034010 A  123 C36Z     LDX     C36PT         POINT X AT OP                                 00 00123
                 124          STABX   0             STORE R IN OP                                 00 00124
000050 055000 A
000051 065001 A
000052 034045 A  125          LDX     C36SVX        RESTORE X                                     00 00125
000053 001000 A  126          JMP     0             EXIT                                          00 00126
000054 000000 A
                 127 **************                                                               00 00127
                 128 * $HS2 ENTRY *                                                              00 00128
                 129 **************                                                               00 00129
000054           131 $HS2      BES     0                                                         00 00131
                 132          FSE                   XFER PARAMETER                                00 00132
000055 002000 A
000056 000000 E
000057 000001 A  133          DATA    1                                                         00 00133
000060           134 C36PT    BSS     1                                                         00 00134
000061 074036 A  135          STX     C36SVX        SAVE X                                        00 00135
000062 001000 A  136          JMP     C36           JUMP BACK FOR FORWARD REF                     00 00136
000063 000000 R
                 137 ********************                                                        00 00137
                 138 * VALID ZERO EXIT *                                                        00 00138
                 139 ********************                                                        00 00139
000064 005003 A  141 C36ZER   ZERO    3             LOAD AB = 0                                   00 00141
000065 001000 A  142          JMP     C36Y          TAKE OK EXIT                                  00 00142
000066 000046 R
                 143 ************                                                                00 00143
                 144 * OVERFLOW *                                                               00 00144
                 145 ************                                                                00 00145
000067 005003 A  147 C36OVF   ZERO    3                                                         00 00147
000070 002000 A  148          CALL    $EE           OUTPUT ' ARITH OVFL'                          00 00148
000071 000000 E
000072 010460 A  149          LDA     BR15          LOAD MAX DP INTEGER                           00 00149
000073 005012 A  150          TAB                                                                 00 00150
000074 034021 A  151          LDX     C36SGF                                                      00 00151
000075 002046 A  152          JXNZM   XDCO          NEGATE AB IF SIGN FLAG SET                    00 00152
000076 000045 E
000077 007401 A  153          SOF                   SET OVFL TO FLAG ERROR                        00 00153
000100 001000 A  154          JMP     C36Z          EXIT                                          00 00154
000101 000047 R
                 155 ************                                                                00 00155
                 156 * $FC ENTRY *                                                              00 00156
                 157 ************                                                                00 00157
000102 000000 A  159 $FC      ENTR                                                              00 00159
000103 002000 A  160          CALL    $HS2                                                      00 00160
000104 000054 R
000105 000113 R  161          PZE     C36OP         OP ADDRESS                                    00 00161
000106 001000 A  162          JMP*    $FC           EXIT                                          00 00162
000107 100102 R
000110 004400 A  163 C36ALS   LASL    0             LEFT SHIFT INSTRUCTION FRAME                  00 00163
000111 004500 A  164 C36ARS   LASR    0             RIGHT SHIFT INSTRUCTION FRAME                 00 00164
000112 000000 A  165 C36E     DATA    0             EXPONENT                                      00 00165
000113 000000 A  166 C36OP    DATA    0,0           STORE I                                       00 00166
000114 000000 A
000115 000000 A  167 C36RH    DATA    0             R(1)                                          00 00167
000116 000000 A  168 C36SGF   DATA    0             SIGN FLAG                                     00 00168
000117 000000 A  169 C36SHF   DATA    0             SHIFT INSTRUCTION                             00 00169
000120 000000 A  170 C36SVX   DATA    0             SAVE X                                        00 00170
000121 000036 A  171 D30      DATA    30                                                        00 00171
                 172          END                                                               00 00172
ENTRY NAMES
000102 R $FC     000054 R $HS2
EXTERNAL NAMES
000071 E $EE     000056 E $SE     000076 E XDCO
SYMBOLS
000071 E $EE     000102 R $FC     000054 R $HS2    000056 E $SE
000475 A BM177   000460 A BR15    000430 A BS7     000000 R C36
000036 R C362    000110 R C36ALS  000111 R C36ARS  000112 R C36E
000113 R C36OP   000067 R C36OVF  000060 R C36PT   000115 R C36RH
000116 R C36SGF  000117 R C36SHF  000120 R C36SVX  000046 R C36Y
000047 R C36Z    000064 R C36ZER  000121 R D30     000420 A MT
000470 A NINE    000430 A O200    000001 A VORTEX  000001 A X
000076 E XDCO
  0 ERRORS ASSEMBLY COMPLETE
```

```
  0   $EE          38   148
159   $FC           3    31   162
131   $HS2         32   160
  0   $SE          42    66
 51   BM177        92
 52   BR15        149
 53   BS7          54
 82   C36         136
107   C362        103
163   C36ALS      102
164   C36ARS      104
165   C36E         90    96
166   C36OP       161
147   C36OVF      100
134   C36PT       123
167   C36RH        87    91    93   109
168   C36SGF,      86   111   151
169   C36SHF      108   110
170   C36SVX      125   135
117   C36Y         95   142
123   C36Z        154
141   C36ZER       98
171   D30          99
 43   FRMWR1       41    65
 70   FRMWR2       67
 50   MT           51    52    53    55
 55   NINE        101
 54   Q200         89
  0   P            74    75
  1   VORTEX       39    40    63    64
 56   X            74    75
  0   XDCO         44   112   152
```

```
000001 A     1 VORTEX SET     1                                                                  00  00001
             3         TITLE   $D2                                                               00  00003
             5 ***************************************************************************      00  00005
             6 *                                                                         *      00  00006
             7 *      D P   I N T E G E R   D O - T E R M I N A T I O N ( $ D 2 )         *      00  00007
             8 *                                                                         *      00  00008
             9 * FUNCTION: TO TERMINATE A DO-LOOP WHEN ALL PARAMS ARE DP INTEGERS        *      00  00009
            10 *                                                                         *      00  00010
            11 * ENTRY: NO SPECIAL CONDITIONS                                            *      00  00011
            12 *                                                                         *      00  00012
            13 * CALLING SEQUENCE:  JMPM  $D2                                           *      00  00013
            14 *                    DATA  ADDRESS OF DO-INCREMENT I                     *      00  00014
            15 *                    DATA  ADDRESS OF DO-VARIABLE V                      *      00  00015
            16 *                    DATA  ADDRESS OF DO-LIMIT L                         *      00  00016
            17 *                    DATA  ADDRESS OF LOOP RETURN R                      *      00  00017
            18 *                                                                         *      00  00018
            19 * EXIT : V = V+I                                                         *      00  00019
            20 *        X,A REGS DESTROYED                                               *      00  00020
            21 *        TO R IF V.LE.L                                                   *      00  00021
            22 *        OTHERWISE DROP THRU                                              *      00  00022
            23 *                                                                         *      00  00023
            24 ***************************************************************************      00  00024
            26 ***********                                                                      00  00026
            27 * ENTRIES *                                                                     00  00027
            28 ***********                                                                      00  00028
            30         NAME    $D2                                                           00  00030
            32 *************                                                                    00  00032
            33 * EXTERNALS *                                                                  00  00033
            34 *************                                                                    00  00034
            36         IFF     VORTEX-4                                                      00  00036
            37         GOTO    FRMWR1                                                        00  00037
            38         EXT     $6K           SOFTWARE DP INTEGER ADD                         00  00038
            39         EXT     $6L           SOFTWARE DP INTEGER SUBTRACT                    00  00039
            40 FRMWR1  CONT                                                                  00  00040
            42 *************                                                                    00  00042
            43 * SET BLOCK *                                                                  00  00043
            44 *************                                                                    00  00044
000420 A    46 MT      SET     0420                                                          00  00046
000460 A    47 BR15    SET     MT+32                                                         00  00047
000002 A    48 B       SET     2             B-REGISTER                                      00  00048
000001 A    49 X       SET     1             X-REGISTER                                      00  00049
            51 **********                                                                    00  00051
            52 * MACROS *                                                                    00  00052
            53 **********                                                                    00  00053
            55 DIA     MAC                                                                   00  00055
            56         IFF     VORTEX-4                                                      00  00056
            57         GOTO    FRMWR1                                                        00  00057
            58         CALL    $6K           SOFTWARE DP INTEGER ADD                         00  00058
            59         DATA    P(1)                                                          00  00059
            60         GOTO    FRMWR2                                                        00  00060
            61 FRMWR1  CONT                                                                  00  00061
            62         DATA    0105334       BCS DP INTEGER ADD                              00  00062
            63         DATA    P(1)                                                          00  00063
            64 FRMWR2  CONT                                                                  00  00064
            65         EMAC                                                                  00  00065
            67 DILD    MAC                                                                   00  00067
            68         IFT     VORTEX-2                                                      00  00068
            69         IFF     VORTEX-4                                                      00  00069
            70         GOTO    FRMWR1                                                        00  00070
            71         LDX     *+4           POINT X AT DP                                   00  00071
            72         LDA     0,X           GET DP IN AB                                    00  00072
            73         LDB     1,X                                                           00  00073
            74         DATA    01006         SKIP                                            00  00074
            75         GOTO    FRMWR2                                                        00  00075
            76 FRMWR1  CONT                                                                  00  00076
            77         DATA    0105032       BCS LOAD AB                                     00  00077
            78 FRMWR2  CONT                                                                  00  00078
            79         EMAC                                                                  00  00079
            80 DIS     MAC                                                                   00  00080
            81         IFF     VORTEX-4                                                      00  00081
            82         GOTO    FRMWR1                                                        00  00082
            83         CALL    $6L           SOFTWARE DP INTEGER SUBTRACT                    00  00083
            84         DATA    P(1)                                                          00  00084
            85         GOTO    FRMWR2                                                        00  00085
            86 FRMWR1  CONT                                                                  00  00086
            87         DATA    0105374       BCS DP INTEGER SUBTRACT                         00  00087
            88         DATA    P(1)                                                          00  00088
            89 FRMWR2  CONT                                                                  00  00089
            90         EMAC                                                                  00  00090
            92 DIST    MAC                                                                   00  00092
            93         IFT     VORTEX-2                                                      00  00093
            94         IFF     VORTEX-4                                                      00  00094
            95         GOTO    FRMWR1                                                        00  00095
            96         LDX     *+4           POINT X AT DP                                   00  00096
            97         STA     0,X           STORE DP                                        00  00097
            98         STB     1,X                                                           00  00098
            99         DATA    01006         SKIP                                            00  00099
           100         GOTO    FRMWR2                                                        00  00100
           101 FRMWR1  CONT                                                                  00  00101
           102         DATA    0105033       BCS STORE AB                                    00  00102
           103 FRMWR2  CONT                                                                  00  00103
           104         EMAC                                                                  00  00104
000000 000000 A  106 $D2    ENTR                                                             00  00106
```

```
000001 006037 A   107          LDXE    $D2          POINT X AT CALLING SEQUENCE                00 00107
000002 000000 R
000003 015000 A   108          LDA     0,X                                                     00 00108
000004 054023 A   109          STA     D2PI         STORE INCREMENT ADDRESS                    00 00109
000005 015001 A   110          LDA     1,X                                                     00 00110
                  111          IFT     VORTEX-2                                                00 00111
                  112          IFF     VORTEX-4                                                00 00112
                  113          GOTO    FRMWR1                                                  00 00113
000006 001002 A   114          JAP     *+2          INDIRECT ?                                 00 00114
000007 000015 R
000010 150460 A   115          ANA     BR15         YES. CLEAR INDIRECT BIT                    00 00115
000011 005012 A   116          TAB                                                             00 00116
000012 016000 A   117          LDA     0,B          GET NEXT LINK                              00 00117
000013 001000 A   118          JMP     *-5          FOLLOW INDIRECT CHAIN                      00 00118
000014 000006 R
                  119 FRMWR1   CONT                                                            00 00119
000015 054007 A   120          STA     D2PV1        STORE VARIABLE ADDRESS                     00 00120
000016 054016 A   121          STA     D2PV2                                                   00 00121
000017 015002 A   122          LDA     2,X                                                     00 00122
000020 054017 A   123          STA     D2PL         STORE LIMIT ADDRESS                        00 00123
                  124          DILD                 AB = V                                     00 00124
000021 034003 A
000022 015000 A
000023 025001 A
000024 001006 A
000025 000000 A   125 D2PV1    DATA    0                                                       00 00125
                  126          DIA     0            AB = V+I                                   00 00126
000026 002000 A
000027 000000 E
000030 000000 A
000030            127 D2PI     BES     0                                                       00 00127
                  128          DIST                 V= AB                                      00 00128
000031 034003 A
000032 055000 A
000033 065001 A
000034 001006 A
000035 000000 A   129 D2PV2    DATA    0                                                       00 00129
                  130          DIS     0            AB = V-L                                   00 00130
000036 002000 A
000037 000000 E
000040 000000 A
000040            131 D2PL     BES     0                                                       00 00131
                  132          IFT     VORTEX-4                                                00 00132
000041 006037 A   133          LDXE    $D2          RESTORE X                                  00 00133
000042 000000 R
000043 001004 A   134          JAN     D2Z          V .LT. L ?                                 00 00134
000044 000051 R
000045 001030 A   135          JIF     030,D2Z      NO. V .EQ. L ?                             00 00135
000046 000051 R
000047 006703 A   136          IJMP    4,X          NO. DROP THRU IN LINE                      00 00136
000050 000004 A
000051 035003 A   137 D2Z      LDX     3,X          V .LE. L                                   00 00137
000052 006703 A   138          IJMP    0,X          RETURN TO R                                00 00138
000053 000000 A
                  139          END                                                             00 00139
ENTRY NAMES
000000 R $D2
EXTERNAL NAMES
000027 E $6K      000037 E $6L
SYMBOLS
000027 E $6K      000037 E $6L      000000 R $D2      000002 A B
000460 A BR15     000030 R D2PI     000040 R D2PL     000025 R D2PV1
000035 R D2PV2    000051 R D2Z      000420 A MT       000001 A VORTEX
000001 A X
  0 ERRORS ASSEMBLY COMPLETE

    0   $6K          38     58
    0   $6L          39     83
  106   $D2           3     30    107    133
   48   B           117
   47   BR15        115
  127   D2PI        109
  131   D2PL        123
  125   D2PV1       120
  129   D2PV2       121
  137   D2Z         134    135
   40   FRMWR1       37     57     70     82     95    113
   64   FRMWR2       60     75     85    100
   46   MT           47
    0   P            59     63     84     88
    1   VORTEX       36     56     60     69     81     93     94    111    112
                    132
   49   X            72     73     97     98    108    110    122    136    137
                    138
```

```
000001 A      1 VORTEX SET     1                                                                                00 00001
              3         TITLE   $TC                                                                            00 00003
              5 ********************************************************************************************** 00 00005
              6 *                                                                                            * 00 00006
              7 *                F L O A T   D P   I N T E G E R ( $ T C )                                    * 00 00007
              8 *                                                                                            * 00 00008
              9 * FUNCTION: TO FLOAT A DP INTEGER I TO A REAL R                                               * 00 00009
             10 *                                                                                            * 00 00010
             11 * ENTRY: AB = I                                                                              * 00 00011
             12 *                                                                                            * 00 00012
             13 * CALLING SEQUENCE:  JMPM $TC     CONVERT                                                     * 00 00013
             14 *                                                                                            * 00 00014
             15 *                     JMPM $Q$2    CONVERT/STORE                                              * 00 00015
             16 *                     DATA DP                                                                 * 00 00016
             17 *                                                                                            * 00 00017
             18 * EXIT :  AB = R                                                                             * 00 00018
             19 *         DP = R IF $QS2 ENTRY                                                               * 00 00019
             20 *                                                                                            * 00 00020
             21 ********************************************************************************************** 00 00021
             23 ***********                                                                                    00 00023
             24 * ENTRIES *                                                                                    00 00024
             25 ***********                                                                                    00 00025
             27         NAME    $TC             CONVERT                                                      00 00027
             28         NAME    $QS2            CONVERT/STORE                                                00 00028
             30 *************                                                                                  00 00030
             31 * EXTERNALS *                                                                                 00 00031
             32 *************                                                                                  00 00032
             34         IFT     VORTEX-2                                                                     00 00034
             35         IFF     VORTEX-4                                                                     00 00035
             36         GOTO    FRMWR1                                                                       00 00036
             37         EXT     $SE             SOFTWARE PARAMETER XFER                                      00 00037
             38 FRMWR1  CONT                                                                                 00 00038
             39         EXT     XDCO            NEGATE AB                                                    00 00039
             41 *************                                                                                  00 00041
             42 * SET BLOCK *                                                                                 00 00042
             43 *************                                                                                  00 00043
000040 A     45 ARST    SET     040             A-REG BIT RESET                                              00 00045
000000 A     46 ASET    SET     0               A-REG BIT SET                                                00 00046
000420 A     47 MT      SET     0420                                                                         00 00047
000430 A     48 BS7     SET     MT+8                                                                         00 00048
000001 A     49 X       SET     1               X-REGISTER                                                   00 00049
             51 ***********                                                                                  00 00051
             52 * MACROS *                                                                                   00 00052
             53 ***********                                                                                  00 00053
             54         NLIS                                                                                 00 00054
             84         LIST                                                                                 00 00084
             86 ********************                                                                         00 00086
             87 * STORE I LOCALLY *                                                                         00 00087
             88 ********************                                                                         00 00088
000000 004041 A  90 C63     LRLB    1                                                                       00 00090
000001 004141 A  91         LSRB    1               CLEAR BIT B(15)                                         00 00091
000002 054111 A  92         STA     C63I            SAVE I(1)                                               00 00092
000003 005031 A  93         MERG    031                                                                     00 00093
000004 001010 A  94         JAZ     C63Z            I=0 ?                                                   00 00094
000005 000070 R
000006 014105 A  95         LDA     C63I            NO. RESTORE I(1)                                        00 00095
000007 005004 A  96         TZX                     CLEAR SIGN FLAG                                         00 00096
000010 001002 A  97         JAP     *+3             IS I NEGATIVE ?                                         00 00097
000011 000013 R
000012 005304 A  98         DECR    4               YES. SET SIGN FLAG                                      00 00098
000013 074107 A  99         STX     C63SGF                                                                  00 00099
000014 002004 A 100         JANM    XDCO            COMPLEMENT AB IF NEGATIVE                               00 00100
000015 000000 E
000016 001002 A 101         JAP     C631            IS I MAX NEGATIVE ?                                     00 00101
000017 000024 R
                102         LDAR    C63MXN          YES. LOAD AB WITH REAL EQUIVALENT                       00 00102
000020 014076 A
000021 024076 A
000022 001000 A 103         JMP     C63Z            AND EXIT                                                00 00103
000023 000070 R
000024 034071 A 104 C631    LDX     C63IE2          LOAD EXPONENT                                           00 00104
000025 001016 A 105         JANZ    C632            HIGH-ORDER WORD ZERO ?                                  00 00105
000026 000031 R
000027 004417 A 106         LASL    15              YES. IGNORE IT                                          00 00106
000030 034064 A 107         LDX     C63IE1          ADJUST EXPONENT                                         00 00107
000031 074061 A 108 C632    STX     C63E            STORE EXPONENT                                          00 00108
                109 ********************                                                                    00 00109
                110 * NORMALIZE LOOP *                                                                      00 00110
                111 ********************                                                                    00 00111
000032 006416 A 113 C63L    BT      ASET+14,C63LX   AB NORMALIZED ?                                         00 00113
000033 000040 R
000034 004401 A 114         LASL    1               SHIFT LEFT 1                                            00 00114
000035 044055 A 115         INR     C63E            BUMP EXPONENT                                           00 00115
000036 001000 A 116         JMP     C63L            LOOP TILL DONE                                          00 00116
000037 000032 R
000040 004507 A 117 C63LX   LASR    7               POSITION MANTISSA                                       00 00117
000041 004460 A 118         LLRL    16              SWAP REGS                                               00 00118
000042 005111 A 119         IAR                     ROUND MANTISSA                                          00 00119
000043 001002 A 120         JAP     C63L2           OVERFLOW ?                                              00 00120
000044 000047 R
000045 005001 A 121         TZA                     YES                                                     00 00121
000046 005122 A 122         IBR                     BUMP HIGH-ORDER WORD                                    00 00122
000047 004460 A 123 C63L2   LLRL    16              SWAP REGS                                               00 00123
```

```
000050 006450 A   124          BT      ARST+8,C63L3    OVERFLOW ?                        00 00124
000051 000056 R
000052 034040 A   125          LDX     C63E            YES                               00 00125
000053 005344 A   126          DXR                     DROP EXPONENT                     00 00126
000054 074036 A   127          STX     C63E                                              00 00127
000055 010430 A   128          LDA     BS7             UPDATE A                          00 00128
000056 004501 A   129 C63L3    LASR    1               POSITION MANTISSA                 00 00129
000057 054034 A   130          STA     C63T            SAVE A                            00 00130
000060 014032 A   131          LDA     C63E            GET EXPONENT                      00 00131
000061 005211 A   132          CPA                                                       00 00132
000062 004247 A   133          LRLA    7               POSITION                          00 00133
000063 114030 A   134          ORA     C63T            MERGE IN HIGH-ORDER MANTISSA WORD 00 00134
000064 034036 A   135          LDX     C63SGF                                            00 00135
000065 001040 A   136          JXZ     *+3             NEGATIVE ?                        00 00136
000066 000070 R
000067 005211 A   137          CPA                     YES. TAKE 1-COMPLEMENT            00 00137
                  139 *********                                                         00 00139
                  140 * EXIT *                                                          00 00140
                  141 *********                                                         00 00141
000070 034019 A   143 C63Z     LDX     C63PT           POINT X AT DP                     00 00143
                  144          STABX   0               STORE R IN DP                     00 00144
000071 055000 A
000072 065001 A
000073 034030 A   145          LDX     C63SVX          RESTORE X                         00 00145
000074 001000 A   146          JMP     0               EXIT                              00 00146
000075 000000 A
                  147 ***************                                                   00 00147
                  148 * $QS2 ENTRY *                                                   00 00148
                  149 ***************                                                   00 00149
000075            151 $QS2     BES     0                                                 00 00151
                  152          FSE                     XFER PARAMETER                    00 00152
000076 002000 A
000077 000000 E
000100 000001 A   153          DATA    1                                                 00 00153
000101            154 C63PT    BSS     1                                                 00 00154
000102 074021 A   155          STX     C63SVX          SAVE X                            00 00155
000103 001000 A   156          JMP     C63             JUMP BACK FOR FORWARD REF         00 00156
000104 000000 R
                  157 **************                                                    00 00157
                  158 * $TC ENTRY *                                                    00 00158
                  159 **************                                                    00 00159
000105 000000 A   161 $TC      ENTR                                                      00 00161
000106 002000 A   162          CALL    $QS2                                              00 00162
000107 000075 R
000110 000121 R   163          FSE     C63DP           DP ADDRESS                        00 00163
000111 001000 A   164          JMP*    $TC             EXIT                              00 00164
000112 100105 R
000113 000000 A   165 C63E     DATA    0               EXPONENT                          00 00165
000114 000000 A   166 C63I     DATA    0               SAVE I(1)                         00 00166
000115 177560 A   167 C63IE1   DATA    0177560         1-WORD INITIAL EXPONENT           00 00167
000116 177541 A   168 C63IE2   DATA    0177541         2-WORD INITIAL EXPONENT           00 00168
000117 130077 A   169 C63MXN   DATA    0130077,0       REAL EQUIV OF MAX NEG DP INTEGER  00 00169
000120 000000 A
000121 000000 A   170 C63DP    DATA    0.0             DP                                00 00170
000122 000000 A
000123 000000 A   171 C63SGF   DATA    0               SIGN FLAG                         00 00171
000124 000000 A   172 C63SVX   DATA    0               SAVE X                            00 00172
       000114 R   173 C63T     EQU     C63I            TEMP STORE                        00 00173
                  174          END                                                       00 00174

ENTRY NAMES
000075 R $QS2    000105 R $TC
EXTERNAL NAMES
000077 E $SE     000015 E XDCO
SYMBOLS
000075 R $QS2    000077 E $SE     000105 R $TC     000040 A ARST
000000 A ASET    000430 A BS7     000000 R C63     000024 R C631
000031 R C632    000110 R C63E    000114 R C63I    000115 R C63IE1
000116 R C63IE2  000032 R C63L    000047 R C63L2   000056 R C63L3
000040 R C63LX   000117 R C63MXN  000121 R C63DP   000161 R C63PT
000123 R C63SGF  000124 R C63SVX  000114 R C63T    000070 R C63Z
000420 A MT      000001 A VORTEX  000001 A X       000015 E XDCO
  0 ERRORS ASSEMBLY COMPLETE
```

```
151   $QS2        28    162
  0   $SE         37     60
161   $TC          3     27    164
 45   ARST       124
 46   ASET       113
 48   BS7        128
 99   C63        156
104   C631       101
108   C632       105
165   C63E       108    115    125    127    131
166   C63I        92     95    173
167   C63IE1     107
168   C63IE2     104
113   C63L       116
123   C63L2      120
129   C63L3      124
117   C63LX      113
169   C63MXN     102
170   C63DP      163
```

```
154   C63PT      143
171   C63SGF      99    135
172   C63SVX     145    155
173   C63T       130    134
143   C63Z        94    103
 38   FRMWR1      36     59     70
 64   FRMWR2      61     73
 47   MT          48
  0   P           71     72     76     81     82
  1   VORTEX      34     35     57     58     68     69
 49   X           81     82
  0   XDCO        39    100
```

```
000001 A    VORTEX SET    1
                   TITLE  $TE
*****************************************************************
*                                                               *
*      R A I S E   R E A L   T O   D P   I N T E G E R   P O W E R   *
*                                                               *
*                          ( $ T E )                            *
*                                                               *
* FUNCTION: TO PERFORM: R**I  WHERE R REAL, I DP INTEGER        *
*                                                               *
* ENTRY: AB=R                                                   *
*                                                               *
* CALLING SEQUENCE:   JMPM $TE                                  *
*                     DATA I                                    *
*                                                               *
* EXIT : AB=R**I                                                *
*        X SAVED                                                *
*                                                               *
* ERRORS: OVFL SET                                              *
*                                                               *
*          UNDERFLOW: AB=0                                      *
*          OVERFLOW : AB=MAX REAL NUMBER, WITH CORRECT SIGN     *
*                                                               *
*****************************************************************
***********
* ENTRIES *
***********
         NAME     $TE
*************
* EXTERNALS *
*************
         IFT      VORTEX-1
         GOTO     FRMWR1
         EXT      $QM           SOFTWARE REAL MULTIPLY
         EXT      $DM           SOFTWARE REAL DIVIDE
FRMWR1   CONT
         IFT      VORTEX-2
         IFF      VORTEX-4
         GOTO     FRMWR1
         EXT      $SE           SOFIWARE PARAMETER XFER
FRMWR1   CONT
         EXT      XDCO          NEGATE REGS AB
**********
* MACROS *
**********
FDV      MAC
         IFT      VORTEX-3
         IFF      VORTEX-4
         GOTO     FRMWR2
         IFT      VORTEX-1
         GOTO     FRMWR1
         CALL     $QM           SOFTWARE REAL DIVIDE
         DATA     P(1)
         GOTO     FRMWR3
FRMWR1   CONT
         DATA     0105034       BCS REAL DIVIDE
         DATA     P(1)
         GOTO     FRMWR3
FRMWR2   CONT
         DATA     0105401       FPP REAL DIVIDE
         DATA     P(1)
FRMWR3   CONT
         EMAC
FLD      MAC
         IFF      VORTEX-1
         GOTO     FRMWR1
         IFT      VORTEX-2
         GOTO     FRMWR2
FRMWR1   CONT
         LDAB     P(1)          LOAD REGS AB
         GOTO     FRMWR3
FRMWR2   CONT
         DATA     0105420       FPP REAL LOAD
         DATA     P(1)
FRMWR3   CONT
         EMAC
FMU      MAC
         IFT      VORTEX-3
         IFF      VORTEX-4
         GOTO     FRMWR2
         IFT      VORTEX-1
         GOTO     FRMWR1
         CALL     $QM           SOFTWARE REAL MULTIPLY
         DATA     P(1)
         GOTO     FRMWR3
FRMWR1   CONT
         DATA     0105074       BCS REAL MULTIPLY
         DATA     P(1)
         GOTO     FRMWR3
FRMWR2   CONT
         DATA     0105416       FPP REAL MULTIPLY
         DATA     P(1)
FRMWR3   CONT
```

```
                104          EMAC                                                                00 00104
                106 FSE      MAC                                                                 00 00106
                107          IFT      VORTEX-2                                                   00 00107
                108          IFF      VORTEX-4                                                   00 00108
                109          GOTO     FRMWR1                                                     00 00109
                110          CALL     $SE                                                        00 00110
                111          GOTO     FRMWR2                                                     00 00111
                112 FRMWR1   CONT                                                                00 00112
                113          DATA     0105036       BCS PARAMETER XFER                           00 00113
                114 FRMWR2   CONT                                                                00 00114
                115          EMAC                                                                00 00115
                117 FST      MAC                                                                 00 00117
                118          IFF      VORTEX-1                                                   00 00118
                119          GOTO     FRMWR1                                                     00 00119
                120          IFT      VORTEX-2                                                   00 00120
                121          GOTO     FRMWR2                                                     00 00121
                122 FRMWR1   CONT                                                                00 00122
                123          STAB     P(1)                                                       00 00123
                124          GOTO     FRMWR3                                                     00 00124
                125 FRMWR2   CONT                                                                00 00125
                126          DATA     0105600       FPP REAL STORE                               00 00126
                127          DATA     P(1)                                                       00 00127
                128 FRMWR3   CONT                                                                00 00128
                129          EMAC                                                                00 00129
                131 LDAB     MAC                                                                 00 00131
                132          IFT      VORTEX-2                                                   00 00132
                133          IFF      VORTEX-4                                                   00 00133
                134          GOTO     FRMWR1                                                     00 00134
                135          LDA      P(1)                                                       00 00135
                136          LDB      P(1)+1                                                     00 00136
                137          GOTO     FRMWR2                                                     00 00137
                138 FRMWR1   CONT                                                                00 00138
                139          DATA     0105032       WCS LOAD AB                                  00 00139
                140          DATA     P(1)                                                       00 00140
                141 FRMWR2   CONT                                                                00 00141
                142          EMAC                                                                00 00142
                144 LDABX    MAC                                                                 00 00144
                145          LDA      P(1),X                                                     00 00145
                146          LDB      P(1)+1,X                                                   00 00146
                147          EMAC                                                                00 00147
                149 MOVPAP   MAC                                                                 00 00149
                150          IFT      VORTEX-2                                                   00 00150
                151          IFF      VORTEX-4                                                   00 00151
                152          GOTO     FRMWR1                                                     00 00152
                153          LDA      P(1)                                                       00 00153
                154          STA      P(2)                                                       00 00154
                155          GOTO     FRMWR2                                                     00 00155
                156 FRMWR1   CONT                                                                00 00156
                157          DATA     0105037       WCS MOVE 2 WORDS THRU AB                     00 00157
                158          DATA     P(1)                                                       00 00158
                159          DATA     P(2)                                                       00 00159
                160 FRMWR2   CONT                                                                00 00160
                161          EMAC                                                                00 00161
                163 STAB     MAC                                                                 00 00163
                164          IFT      VORTEX-2                                                   00 00164
                165          IFF      VORTEX-4                                                   00 00165
                166          GOTO     FRMWR1                                                     00 00166
                167          STA      P(1)                                                       00 00167
                168          STB      P(1)+1                                                     00 00168
                169          GOTO     FRMWR2                                                     00 00169
                170 FRMWR1   CONT                                                                00 00170
                171          DATA     0105033       WCS STORE AB                                 00 00171
                172          DATA     P(1)                                                       00 00172
                173 FRMWR2   CONT                                                                00 00173
                174          EMAC                                                                00 00174
                176 TNAP     MAC                                                                 00 00176
                177          LDA      P(1)                                                       00 00177
                178          JAN      P(2)                                                       00 00178
                179          EMAC                                                                00 00179
                181 TNEPP    MAC                                                                 00 00181
                182          LDA      P(1)                                                       00 00182
                183          ERA      P(2)                                                       00 00183
                184          JANZ     P(3)                                                       00 00184
                185          EMAC                                                                00 00185
                187 TNZAP    MAC                                                                 00 00187
                188          LDA      P(1)                                                       00 00188
                189          JANZ     P(2)                                                       00 00189
                190          EMAC                                                                00 00190
                191 TPAP     MAC                                                                 00 00191
                192          LDA      P(1)                                                       00 00192
                193          JAP      P(2)                                                       00 00193
                194          EMAC                                                                00 00194
                196 TRAP     MAC                                                                 00 00196
                197          LDA      P(1)                                                       00 00197
                198          BT       ARST+P(2),P(3)                                             00 00198
                199          EMAC                                                                00 00199
                201 TZAP     MAC                                                                 00 00201
                202          LDA      P(1)                                                       00 00202
                203          JAZ      P(2)                                                       00 00203
                204          EMAC                                                                00 00204
                206          LIST                                                                00 00206
                207 **********                                                                   00 00207
                208 * SET BLOCK *                                                                00 00208
```

```
                        209 **************
          000420  A     211 MT      SET     0420
          000040  A     212 ARST    SET     040
          000000  A     213 B0      SET     0
          000421  A     214 B30     SET     MT+1
          000460  A     215 BR15    SET     MT+32
          000001  A     216 X       SET     1
                        218 ************************
                        219 * STORE OPS LOCALLY *
                        220 ************************
                        222 E36     STAB    E36P

000000  054205  A
000001  064205  A
000002  004317  A     223         ASRA    15
000003  054201  A     224         STA     E36SM
000004  034167  A     226         LDX     E36PT
                      228         LDABX   0

000005  015000  A
000006  025001  A
000007  004041  A     229         LPLB    1
000010  004141  A     230         LSRB    1
                      231         STAB    E36I

000011  054171  A
000012  064171  A
                      232 ************************************
                      233 * TEST FOR SPECIAL VALUES OF OPS *
                      234 ************************************
000013  005031  A     236         MERG    031
000014  114171  A     237         ORA     E36R
000015  114171  A     238         ORA     E36R+1
000016  001010  A     239         JAZ     E36EON          0.0**0 = ERROR
000017  000143  R
000020  005021  A     240         TBA
000021  114161  A     241         ORA     E36I
000022  001010  A     242         JAZ     E36ONE          R**0 = 1.0
000023  000154  R
000024  014161  A     243         LDA     E36R
000025  114161  A     244         ORA     E36R+1
000026  001016  A     245         JANZ    E361            R=0.0 ?
000027  000035  R
                      246         TNAP    E36I,E36020     YES. 0.0**(-I) = OVERFLOW

000030  014152  A
000031  001004  A
000032  000147  R
000033  001000  A     247         JMP     E36ZER          0**I = 0.0
000034  000160  R
                      248 E361    TNEPP   E36P,E36F1,E362  R=1.0 ?

000035  014150  A
000036  134142  A
000037  001016  A
000040  000044  R
                      249         TZAP    E36P+1,E36ONE

000041  014145  A
000042  001010  A
000043  000154  R
                      250 E362    TPAP    E36I,E363       TEST SIGN OF EXPONENT I

000044  014136  A
000045  001002  A
000046  000065  R
                      251 **************
                      252 * NEGATIVE I *
                      253 **************
000047  014133  A     255         LDA     E361            RESTORE A
000050  002000  A     256         CALL    XDCN            NEGATE I
000051  000000  E
000052  001004  A     257         JAN     E36I20          ERROR IF INVALID I
000053  000147  R
                      258         STAB    E361            STORE ABS I

000054  054126  A
000055  064126  A
                      259         FLD     E36F1           GET 1.0

000056  014120  A
000057  024120  A
                      260         FDV     E36P            SET P = 1.0/R

000060  002000  A
000061  000000  E
000062  000206  R
                      261         FST     E36P

000063  054120  A
000064  064120  A
                      262 ************************
                      263 * INITIALIZE EXPONENT LOOP *
                      264 ************************
                      266 E363    MDVPAP  BR15,E36CNT

000065  010460  A
000066  054111  A
000067  014111  A     267         LDA     E36I+1
000070  150421  A     268         ANA     B30
000071  001014  A     269         JANZ    E36L            IS EXPONENT I EVEN ?
000072  000071  R
000073  054111  A     270         STA     E36SM           YES. CLEAR OVERFLOW MASK
                      271 ****************
                      272 * EXPONENTIAL LOOP *
```

```
                    273 **********************                                                  00 00273
                    275 E36L    TRAP    E36I+1,B0,E36L2   IS EXPONENT BIT SET ?                00 00275
000074 014107 A
000075 006440 A
000076 000114 R
                    276         FLD     E36P              YES                                  00 00276
000077 014106 A
000100 024106 A
000101 007400 A     277         RDF                                                            00 00277
000102 044075 A     278         INR     E36CNT            BUMP LOOP COUNT                      00 00278
000103 001001 A     279         JDF     E36L1             SKIP MULTIPLY BY 1.0 ON 1ST LOOP     00 00279
000104 000112 R
                    280         FMU     E36V              GET V=V*P                            00 00280
000105 002000 A
000106 000000 E
000107 000211 R
                    281         IFF     VORTEX-1                                               00 00281
000110 001001 A     282         JDF     E36X              OVER/UNDER/FLOW ?                    00 00282
000111 000163 R
                    283 E36L1   FST     E36V              NO                                   00 00283
000112 054076 A
000113 064076 A
                    284 E36L2   LDAB    E36I              GET EXPONENT                         00 00284
000114 014066 A
000115 024066 A
000116 004501 A     285         LASR    1                 SHIFT OFF LOW BIT                    00 00285
                    286         STAB    E36I              UPDATE I                             00 00286
000117 054063 A
000120 064063 A
000121 005031 A     287         MERGE   031                                                    00 00287
000122 001010 A     288         JAZ     E36LY             FINISHED ?                           00 00288
000123 000137 R
                    289         FLD     E36P              NO                                   00 00289
000124 014061 A
000125 024061 A
                    290         FMU     E36P              SET P=P**2                           00 00290
000126 002000 A
000127 000106 E
000130 000206 R
                    291         IFF     VORTEX-1                                               00 00291
000131 001001 A     292         JDF     E36X              OVER/UNDER/FLOW ?                    00 00292
000132 000163 R
                    293         FST     E36P              NO                                   00 00293
000133 054052 A
000134 064052 A
000135 001000 A     294         JMP     E36L              LOOP TILL DONE                       00 00294
000136 000074 R
                    295 E36LY   LDAB    E36V              LOAD AB=V ON EXIT                    00 00295
000137 014051 A
000140 024051 A
000141 001000 A     296         JMP     E36Y              TAKE OK EXIT                         00 00296
000142 000165 R
                    297 ***************                                                        00 00297
                    298 * 0**0 ERROR *                                                        00 00298
                    299 ***************                                                        00 00299
                    301 E36EON  LDAB    E36F1             LOAD AB=1.0                          00 00301
000143 014035 A
000144 024035 A
000145 001000 A     302         JMP     E36X              TAKE ERROR EXIT                      00 00302
000146 000163 R
                    303 ******************                                                     00 00303
                    304 * 0**(-I) ERROR *                                                     00 00304
                    305 ******************                                                     00 00305
000147 010460 A     307 E36020  LDA     BR15              LOAD AB WITH MAX REAL                00 00307
000150 005012 A     308         TAB                                                            00 00308
000151 134033 A     309         ERA     E36SM             ADJUST SIGN                          00 00309
000152 001000 A     310         JMP     E36X              TAKE ERROR EXIT                      00 00310
000153 000163 R
                    311 ***********************                                                00 00311
                    312 * RETURN ONE VALID *                                                  00 00312
                    313 ***********************                                                00 00313
                    315 E36ONE  LDAB    E36F1             LOAD AB=1.0                          00 00315
000154 014024 A
000155 024024 A
000156 001000 A     316         JMP     E36Y              TAKE OK EXIT                         00 00316
000157 000165 R
                    317 ************************                                               00 00317
                    318 * RETURN ZERO VALID *                                                 00 00318
                    319 ************************                                               00 00319
000160 005003 A     321 E36ZER  ZERO    3                 LOAD AB=0.0                          00 00321
000161 001000 A     322         JMP     E36Y              TAKE OK EXIT                         00 00322
000162 000165 R
                    323 *****************                                                      00 00323
                    324 * INVALID EXIT *                                                     00 00324
                    325 *****************                                                      00 00325
000163 007401 A     327 E36X    SDF                       SET OVFL TO FLAG ERROR               00 00327
000164 001006 A     328         DATA    01006             SKIP                                 00 00328
                    329 ***************                                                        00 00329
                    330 * VALID EXIT *                                                       00 00330
                    331 ***************                                                        00 00331
000165 007400 A     333 E36Y    RDF                       RESET OVFL TO FLAG OK                00 00333
000166 034021 A     334 E36Z    LDX     E36SVX            RESTORE X                            00 00334
000167 001000 A     335         JMP     0                 EXIT                                 00 00335
```

```
000170 000000 A
                      336 **********                                                    00 00336
                      337 * ENTRY *                                                     00 00337
                      338 **********                                                    00 00338
000170                340 $TE     BES     0         ENTR                              00 00340
                      341         FSE               PARAMETER XFER                    00 00341
000171 002000 A
000172 000000 E
000173 000001 A       342         DATA    1                                           00 00342
000174                343 E36PT   BSS     1         POINTER TO I                      00 00343
000175 074012 A       344         STX     E36SVX    SAVE X-REG                        00 00344
000176 001000 A       345         JMP     E36       JUMP BACK FOR FORWARD REFERENCE   00 00345
000177 000001 E
000200 000000 A       346 E36CNT  DATA    0         LOOP COUNT                        00 00346
000201 040300 A       347 E36F1   DATA    040300,0  REAL 1.0                          00 00347
000202 000000 A
000203 000000 A       348 E36I    DATA    0,0       DP INTEGER EXPONENT I             00 00348
000204 000000 A
000205 000000 A       349 E36SM   DATA    0         SIGN MASK                         00 00349
000206 000000 A       350 E36R    DATA    0,0       REAL OPERAND R                    00 00350
000210 000000 A
000211 000000 A       351 E36P    EQU     E36R      POWER P = R**K                    00 00351
000212 000000 A       352 E36SVX  DATA    0         SAVE X-REG                        00 00352
000213 000000 A       353 E36V    DATA    0,0       CURRENT VALUE                     00 00353
000214 000000 A
                      354         END                                               00 00354
ENTRY NAMES
000170 R $TE
EXTERNAL NAMES
000127 E $OM    000061 E $ON    000172 E $SE    000051 E XDCO
SYMBOLS
000127 E $OM    000061 E $ON    000172 E $SE    000175 R $TE
000040 A ARST   000000 A B0     000460 A BR15   000421 A BS0
000000 R E36    000035 R E361   000041 R E362   000045 R E363
000200 R E36CNT 000143 R E36EON 000201 R E36F1  000203 R E36I
000074 R E36L   000112 R E36L1  000111 R E36L2  000137 R E36LY
000147 R E36020 000154 R E36ONE 000206 R E36P   000174 R E36PT
000206 R E36R   000205 R E36SM  000210 R E36SVX 000211 R E36V
000160 R E36X   000165 R E36Y   000166 R E362   000160 R E362ER
000420 A MT     000001 A VORTEX 000001 A X      000051 E XDCO
  0 ERRORS ASSEMBLY COMPLETE


    0   $OM          40     93
    0   $ON          41     60
    0   $SE          46    110
  340   $TE           3     32
  212   ARST        198
  213   B0          275
  215   BR15        266    307
  214   BS0         260
  222   E36         345
  240   E361        245
  250   E362        248
  266   E363        250
  346   E36CNT      266    278
  301   E36EON      239
  347   E36F1       248    259    301    315
  348   E36I        231    241    246    250    255    258    267    275    284
                    286
  275   E36L        269    294
  283   E36L1       279
  284   E36L2       270
  295   E36LY       288
  307   E36020      246    257
  315   E36ONE      242    249
  351   E36P        248    249    260    261    276    289    290    293
  343   E36PT       226
  350   E36R        222    237    238    240    244    351
  349   E36SM       224    270    300
  352   E36SVX      272    344
  353   E36V        260    283    295
  327   E36X        220    228    302    314
  333   E36Y        230    318    321
  321   E362ER      242
   42   FRMWR1       38     45     50     75     92    109    119    134    152
                    166
   67   FRMWR2       57     77     80    111    121    137    155    169
   70   FRMWR3       62     66     88     95     99    124
  211   MT          214    215
    0   P            61     65     67     79     83     94     98    102    123
                    125    135    140    142    145    148    151    154    158
                    160    162    165    173    177    178    182    183    184
                    185    189    192    193    197    198    200    202    203
    1   VORTEX       28     43     44     56     58     59     74     76     88
                     89     91    102    104    118    120    130    131    150
                    151    164    167    201    201
  210   X           145    146
    0   XDCO         49     56
```

```
      TITLE $4E                                                                 00 00001
C                                                                               00 00002
C*******************************************************************************00 00003
C                                                                              *00 00004
C          D O U B L E   P R E C I S I O N  F L O A T I N G                    *00 00005
C                                                                              *00 00006
C  T O   D O U B L E   P R E C I S I O N   I N T E G E R   P O W E R           *00 00007
C                                                                              *00 00008
*                          ( $ 4 E )                                           *00 00009
C                                                                              *00 00010
C FUNCTION: TO CALCULATE D**I: D IS DP FLOATING, I IS DP INTEGER               *00 00011
C                                                                              *00 00012
C ENTRY: AC = D                                                                *00 00013
C                                                                              *00 00014
C CALLING SEQUENCE:  JMPM $4E                                                  *00 00015
C                    DATA I                                                    *00 00016
C                                                                              *00 00017
C EXIT : AC = D**I                                                             *00 00018
C                                                                              *00 00019
C*******************************************************************************00 00020
C                                                                               00 00021
      SUBROUTINE $4E(I)                                                         00 00022
      INTEGER*4 I,J,L                                                           00 00023
      DOUBLE PRECISION POWER,VALUE                                              00 00024
C                                                                               00 00025
C INITIALIZE POWER TO D                                                         00 00026
C                                                                               00 00027
      CALL $ZS(POWER)                                                           00 00028
C                                                                               00 00029
C INITIALIZE VALUE                                                              00 00030
C                                                                               00 00031
      VALUE=1.0D0                                                               00 00032
C                                                                               00 00033
C INITIALIZE EXPONENT COUNTER L                                                 00 00034
C                                                                               00 00035
      L=I                                                                       00 00036
C                                                                               00 00037
C************************                                                       00 00038
C EXPONENTIATION LOOP *                                                         00 00039
C************************                                                       00 00040
C                                                                               00 00041
C EXIT WHEN EXPONENT COUNT = 0                                                  00 00042
C                                                                               00 00043
   10 IF(L) 20,50,20                                                            00 00044
C                                                                               00 00045
C MULTIPLY VALUE BY POWER IF LOWEST EXPONENT BIT SET                            00 00046
C                                                                               00 00047
   20 J=L/2                                                                     00 00048
      J=2*J                                                                     00 00049
      IF(L-J) 30,40,30                                                          00 00050
   30 VALUE=VALUE*POWER                                                         00 00051
C                                                                               00 00052
C BUMP POWER                                                                    00 00053
C                                                                               00 00054
   40 POWER=POWER*POWER                                                         00 00055
C                                                                               00 00056
C SHIFT EXPONENT TO POSITION NEXT BIT AND CONTINUE LOOP                         00 00057
C                                                                               00 00058
      L=L/2                                                                     00 00059
      GO TO 10                                                                  00 00060
C                                                                               00 00061
C EXPONENTIATION COMPLETE. CHECK SIGN                                           00 00062
C                                                                               00 00063
   50 IF(I) 60,70,70                                                            00 00064
C                                                                               00 00065
C NEGATIVE EXPONENT. EXIT WITH AC=1/VALUE                                       00 00066
C                                                                               00 00067
   60   =1.0D0/VALUE                                                           00 00068
        RETURN                                                                  00 00069
C                                                                               00 00070
C POSITIVE EXPONENT. EXIT WITH AC=VALUE                                         00 00071
C                                                                               00 00072
   70   =VALUE                                                                 00 00073
        RETURN                                                                  00 00074
        END                                                                     00 00075
ENTRY/COMMON BLOCK NAMES
                    R   000000 $4E
EXTERNAL NAMES
                    E   000002 $SE
                    E   000112 $ZS
                    E   000152 $ZF
                    E   000121 $6N
                    E   000054 $6M
                    E   000063 $6L
                    E   000066 $6D
                    E   000107 $ZM
                    E   000145 $ZN
SYMBOL TABLE
                    R   100004 I
                    R   000176 J
                    R   000172 L
                    R   000156 POWER
                    R   000166 VALUE
```

```
                    R   000162 000201 040000 000000 000000
                    R   000031 >10
                    R   000124 >D00
                    R   000040 >20
                    R   000131 >50
                    R   000174 000000 000002
                    R   000072 >30
                    R   000103 >40
                    R   000141 >60
                    R   000151 >70
                  PROGRAM SIZE 000200
0 ERRORS COMPILATION COMPLETE
```

```
                TITLE  $DE                                                                    00  00001
      C                                                                                       00  00002
      C*****************************************************************************        00  00003
      C                                                                            *        00  00004
      C    C O M P L E X   T O   D P   I N T E G E R   P O W E R ( $ D E )         *        00  00005
      C                                                                            *        00  00006
      C FUNCTION: TO CALCULATE C**I: C COMPLEX, I DP INTEGER                       *        00  00007
      C                                                                            *        00  00008
      C ENTRY: CA = C      (CA IS COMPLEX ACCUMULATOR)                             *        00  00009
      C                                                                            *        00  00010
      C CALLING SEQUENCE:   JMPM $DE                                               *        00  00011
      C                     DATA I                                                 *        00  00012
      C                                                                            *        00  00013
      C EXIT : CA = C**2                                                           *        00  00014
      C                                                                            *        00  00015
      C*****************************************************************************        00  00016
      C                                                                                       00  00017
                SUBROUTINE $DE(I)                                                             00  00018
                INTEGER*4 I,J                                                                 00  00019
                COMPLEX Z1,Z2                                                                 00  00020
      C                                                                                       00  00021
      C   STORE C IN Z1 AND Z2                                                               00  00022
      C                                                                                       00  00023
                CALL $8S(Z1)                                                                  00  00024
                CALL $8S(Z2)                                                                  00  00025
      C                                                                                       00  00026
      C   SET J = IABS(I)                                                                    00  00027
      C                                                                                       00  00028
                J=I                                                                           00  00029
                IF(J.LT.0) J=-I                                                               00  00030
      C                                                                                       00  00031
      C   REPEAT MULTIPLY LOOP                                                              00  00032
      C                                                                                       00  00033
             10 J=J-1                                                                         00  00034
                IF(J) 60,30,20                                                                00  00035
             20 Z1=Z1*Z2                                                                      00  00036
                GO TO 10                                                                      00  00037
      C                                                                                       00  00038
      C   ADJUST FOR SIGN OF I                                                              00  00039
      C                                                                                       00  00040
             30 IF(I) 40,50,50                                                                00  00041
      C                                                                                       00  00042
      C   NEGATIVE I.   C**I = (1.0,0.0)/C**(-I)                                           00  00043
      C                                                                                       00  00044
             40   =(1.0,0.0)/Z1                                                             00  00045
                RETURN                                                                        00  00046
      C                                                                                       00  00047
      C   POSITIVE I                                                                        00  00048
      C                                                                                       00  00049
             50   =Z1                                                                       00  00050
                RETURN                                                                        00  00051
      C                                                                                       00  00052
      C   I=0.   C**0 = (1.0,0.0)                                                           00  00053
      C                                                                                       00  00054
             60   =(1.0,0.0)                                                               00  00055
                RETURN                                                                        00  00056
                END                                                                           00  00057
ENTRY/COMMON BLOCK NAMES
                       R  000000 $DE
EXTERNAL NAMES
                       E  000002 $SE
                       E  000074 $8S
                       E  000040 $6D
                       E  000052 $6L
                       E  000126 $8F
                       E  000071 $8M
                       E  000114 $8N
SYMBOL TABLE
                       R  100004 I
                       R  000142 J
                       R  000132 Z1
                       R  000136 Z2
                       R  000055 )D00
                       R  000045 )10
                       R  000144 000000 000001
                       R  000125 )60
                       R  000100 )30
                       R  000065 )20
                       R  000110 )40
                       R  000120 )50
                       R  000146 040300 000000 000000 000000
                  PROGRAM SIZE 000152
  0 ERRORS COMPILATION COMPLETE
```

```
000001 A     1 VORTEX SET     1                                                                  00  00001
             3         TITLE   $GC                                                               00  00003
             5 ***************************************************************************      00  00005
             6 *                                                                         *      00  00006
             7 *      F I X   D P   F L O A T I N G   T O   D P   I N T E G E R          *      00  00007
             8 *                                                                         *      00  00008
             9 *                            ( $ G C )                                    *      00  00009
            10 *                                                                         *      00  00010
            11 * FUNCTION: TO FIX A DOUBLE PRECISION FLOATING POINT NUMBER D             *      00  00011
            12 *           TO A DOUBLE PRECISION INTEGER I                               *      00  00012
            13 *                                                                         *      00  00013
            14 * ENTRY: AC = D                                                           *      00  00014
            15 *                                                                         *      00  00015
            16 * EXIT : AB = I                                                           *      00  00016
            17 *                                                                         *      00  00017
            18 * ERRORS: OVERFLOW: OVFL SET                                             *      00  00018
            19 *         AB = MAX DP INTEGER OF CORRECT SIGN                             *      00  00019
            20 *         $EE CALLED TO OUTPUT ' ARITH OVFL'                              *      00  00020
            21 *                                                                         *      00  00021
            22 ***************************************************************************      00  00022
            24 ***********                                                                      00  00024
            25 * ENTRIES *                                                                      00  00025
            26 ***********                                                                      00  00026
            28         NAME    $GC                                                           00  00028
            30 *************                                                                    00  00030
            31 * EXTERNALS *                                                                   00  00031
            32 *************                                                                    00  00032
            34         EXT     $EE             ERROR MESSAGE PROCESSOR                       00  00034
            35         EXT     $ZS             STORE AC                                      00  00035
            36         EXT     XDCO            NEGATE AB                                  V7500  00036
            38 *************                                                                    00  00039
            39 * SET BLOCK *                                                                   00  00039
            40 *************                                                                    00  00040
000420 A    42 MT      SET     0420                                                          00  00042
000460 A    43 BR15    SET     MT+32                                                         00  00043
000430 A    44 BS7     SET     MT+8                                                          00  00044
000430 A    45 D200    SET     BS7                                                           00  00045
000001 A    46 X       SET     1               X-REGISTER                                    00  00046
            48 ***********                                                                   00  00048
            49 * MACROS *                                                                    00  00049
            50 ***********                                                                   00  00050
            52 LDAB    MAC                                                                   00  00052
            53         IFT     VORTEX-2                                                      00  00053
            54         IFF     VORTEX-4                                                      00  00054
            55         GOTO    FRMWR1                                                        00  00055
            56         LDA     P(1)                                                          00  00056
            57         LDB     P(1)+1                                                        00  00057
            58         GOTO    FRMWR2                                                        00  00058
            59 FRMWR1  CONT                                                                  00  00059
            60         DATA    0105032         WCS LOAD AB                                   00  00060
            61         DATA    P(1)                                                          00  00061
            62 FRMWR2  CONT                                                                  00  00062
            63         EMAC                                                                  00  00063
            65 ********************                                                          00  00065
            66 * STORE D LOCALLY *                                                           00  00066
            67 ********************                                                          00  00067
000000 000000 A     69 $GC     ENTR                                                          00  00069
000001 074073 A     70         STX     C46SVX          SAVE X                                00  00070
000002 002000 A     71         CALL    $ZS             STORE D FROM AC                       00  00071
000003 000000 E
000004 000065 R     72         PZE     C46D                                                  00  00072
                    74 ********************************                                      00  00074
                    75 * TEST FOR SPECIAL VALUES OF D *                                      00  00075
                    76 ********************************                                      00  00076
000005 005004 A     78         TZX                     CLEAR SIGN FLAG                       00  00078
000006 014057 A     79         LDA     C46D+1                                                00  00079
000007 001002 A     80         JAP     *+4             IS D NEGATIVE ?                       00  00080
000010 000013 R
000011 005211 A     81         CPA                     YES. CONVERT TO ABS                   00  00081
000012 005304 A     82         DECR    4               SET SIGN FLAG                         00  00082
000013 074057 A     83         STX     C46SGF          LOAD SIGN FLAG                        00  00083
000014 054051 A     84         STA     C46D+1          UPDATE D SIGN WORD                    00  00084
000015 114051 A     85         ORA     C46D+2                                                00  00085
000016 114051 A     86         ORA     C46D+3                                                00  00086
000017 001010 A     87         JAZ     C46ZER          D=0.0D0 ?                             00  00087
000020 000051 R
000021 014043 A     88         LDA     C46D            GET EXPONENT OF D                     00  00088
000022 140430 A     89         SUB     D200                                                  00  00089
000023 054045 A     90         STA     C46E                                                  00  00090
000024 005311 A     91         DAR                                                           00  00091
000025 001004 A     92         JAN     C46ZER          I=0 IF ABS(D) .LT. 1.0D0              00  00092
000026 000051 R
000027 144046 A     93         SUB     D30                                                   00  00093
000030 001002 A     94         JAP     C46OVF          OVERFLOW  ?                           00  00094
000031 000055 R
000032 014043 A     95         LDA     D30                                                   00  00095
000033 144035 A     96         SUB     C46E            GET SHIFT COUNT                       00  00096
000034 114035 A     97         ORA     C46RSH          CONSTRUCT SHIFT INSTRUCTION           00  00097
000035 054036 A     98         STA     C46SHF          STORE                                 00  00098
                    99         LDAB    C46D+1          GET D(1),D(2)                         00  00099
000036 014027 A
000037 024027 A
000040 003000 A    100         XEC     C46SHF          POSITION                              00  00100
```

```
000041 000074 R
000042 007400 A   101          ROF                RESET OVFL TO FLAG OK                    00 00101
000043 034027 A   102 C46Y     LDX     C46SGF                                              00 00102
000044 002046 A   103          JXNZM   XDCO       NEGATE AB IF D NEGAT IVE                V700 00103
000045 000000 E
                  104 ********                                                            00 00104
                  105 * EXIT *                                                            00 00105
                  106 ********                                                            00 00106
000046 034026 A   108          LDX     C46SVX     SAVE X                                   00 00108
000047 001000 A   109          JMP*    $GC                                                 00 00109
000050 100000 R
                  110 ************                                                        00 00110
                  111 * SET I = 0 *                                                      00 00111
                  112 ************                                                        00 00112
000051 005003 A   114 C46ZER  ZERO     3          SET AB = 0                               00 00114
000052 007400 A   115          ROF                RESET OVFL TO FLAG OK                    00 00115
000053 001000 A   116          JMP*    $GC        EXIT                                     00 00116
000054 100000 R
                  117 ***********                                                         00 00117
                  118 * OVERFLOW *                                                       00 00118
                  119 ***********                                                         00 00119
000055 005003 A   121 C46OVF  ZERO     3                                                   00 00121
000056 002000 A   122          CALL    $EE        OUTPUT ' ARITH OVFL'                     00 00122
000057 000000 E
000060 010460 A   123          LDA     BR15       LOAD AB WITH MAX DP INTEGER              00 00123
000061 005012 A   124          TAB                                                         00 00124
000062 007401 A   125          SOF                SET OVFL TO FLAG ERROR                   00 00125
000063 001000 A   126          JMP     C46Y                                                00 00126
000064 000043 R
000065 000000 A   127 C46D     DATA    0,0,0,0    D                                        00 00127
000066 000000 A
000067 000000 A
000070 000000 A
000071 000000 A   128 C46E     DATA    0          EXPONENT                                 00 00128
000072 004500 A   129 C46RSH  LASR    0          SHIFT INSTRUCTION FRAME                  00 00129
000073 000000 A   130 C46SGF  DATA    0          SIGN FLAG                                00 00130
000074 000000 A   131 C46SHF  DATA    0          SHIFT INSTRUCTION                        00 00131
000075 000000 A   132 C46SVX  DATA    0          SAVE X                                   00 00132
000076 000036 A   133 D30      DATA    30                                                 V7500 00133
                  134          END                                                        00 00134
ENTRY NAMES
000000 R $GC
EXTERNAL NAMES
000057 E $EE      000003 E $ZS      000045 E XDCO
SYMBOLS
000057 E $EE      000000 R $GC      000003 E $ZS      000460 A BR15
000430 A BS7      000065 R C46D     000071 R C46E     000055 R C46OVF
000072 R C46RSH   000073 R C46SGF   000074 R C46SHF   000075 R C46SVX
000043 R C46Y     000051 R C46ZER   000076 R D30      000420 A MT
000430 A 0200     000001 A VORTEX   000001 A X        000045 E XDCO
  0 ERRORS ASSEMBLY COMPLETE

    0   $EE          34   122
   69   $GC           3    28   109   116
    0   $ZS          35    71
   43   BR15        123
   44   BS7          45
  127   C46D         72    79    84    85    86    88    99
  128   C46E         90    96
  121   C46OVF       94
  129   C46RSH       97
  130   C46SGF       83   102
  131   C46SHF       98   100
  132   C46SVX       70   108
  102   C46Y        126
  114   C46ZER       87    92
  133   D30          93    95
   59   FRMWR1       55
   62   FRMWR2       58
   42   MT           43    44
   45   0200         89
    0   P            56    57    61
    1   VORTEX       53    54
    0   XDCO         36   103
```

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             3         TITLE   $4C                                                               00 00003
             5 ***************************************************************************      00 00005
             6 *                                                                         *      00 00006
             7 *  C O N V E R T   D P   I N T E G E R   T O   D P   F L O A T I N G     *      00 00007
             8 *                                                                         *      00 00008
             9 *                              ( $ 4 C )                                  *      00 00009
            10 *                                                                         *      00 00010
            11 * FUNCTION: TO CONVERT A DP INTEGER I TO A DP FLOATING POINT              *      00 00011
            12 *           NUMBER D.                                                     *      00 00012
            13 *                                                                         *      00 00013
            14 * ENTRY: AB = I                                                          *      00 00014
            15 *                                                                         *      00 00015
            16 * EXIT : AC = D    ( AC IS DP ACCUMULATOR )                              *      00 00016
            17 *                                                                         *      00 00017
            18 ***************************************************************************      00 00018
            20 ***********                                                                      00 00020
            21 * ENTRIES *                                                                     00 00021
            22 ***********                                                                      00 00022
            24         NAME    $4C                                                           00 00024
            26 *************                                                                    00 00026
            27 * EXTERNALS *                                                                  00 00027
            28 *************                                                                    00 00028
            30         EXT     $ZF             LOAD AC WITH DP FLOATING NUMBER               00 00030
            31         EXT     AC              DP FLOATING POINT ACCUMULATOR                 00 00031
            32         EXT     XDCO            NEGATE AB                                     00 00032
            34 *************                                                                    00 00034
            35 * SET BLOCK *                                                                  00 00035
            36 *************                                                                    00 00036
000000 A    38 ASET    SET     0               A-REG BIT SET                                 00 00038
000420 A    39 MT      SET     0420                                                          00 00039
000457 A    40 BR14    SET     MT+31                                                         00 00040
000001 A    41 X       SET     1               X-REGISTER                                    00 00041
            43 ******************                                                           00 00043
            44 * PREPROCESSING *                                                           00 00044
            45 ******************                                                           00 00045
000000 004041 A    47 C64     LRLB    1               CLEAR B(15)                           00 00047
000001 004141 A    48         LSRB    1                                                     00 00048
000002 005004 A    49         TZX                     CLEAR SIGN FLAG                       00 00049
000003 001002 A    50         JAP     *+3             AB NEGATIVE ?                         00 00050
000004 000006 R
000005 005304 A    51         DECR    4               YES. SET SIGN FLAG                    00 00051
000006 074073 A    52         STX     C64SGF          LOAD SIGN FLAG                        00 00052
000007 002004 A    53         JANM    XDCO            GET AB = ABS(I)                       00 00053
000010 000000 E
000011 001004 A    54         JAN     C64MN           TEST FOR MAX NEGATIVE I               00 00054
000012 000063 R
000013 001016 A    55         JANZ    C641            I(1)=0 ?                              00 00055
000014 000023 R
000015 001020 A    56         JBZ     C64ZER          YES. I=0 ?                            00 00056
000016 000055 R
000017 054055 A    57         STA     C64D+2          NO. CLEAR D(2)                        00 00057
000020 004417 A    58         LASL    15              POSITION I                            00 00058
000021 034056 A    59         LDX     C64E1           LOAD EXPONENT                         00 00059
000022 001006 A    60         DATA    01006           SKIP                                  00 00060
000023 034055 A    61 C641    LDX     C64E2           LOAD EXPONENT                         00 00061
000024 074052 A    62         STX     C64E            SAVE EXPONENT                         00 00062
            64 ******************                                                           00 00064
            65 * NORMALIZE LOOP *                                                          00 00065
            66 ******************                                                           00 00066
000025 006416 A    68 C64L    BT      ASET+14,C64LX       NORMALIZED ?                      00 00068
000026 000033 R
000027 004401 A    69         LASL    1               NO. SHIFT LEFT 1                      00 00069
000030 044046 A    70         INR     C64E            BUMP EXPONENT                         00 00070
000031 001000 A    71         JMP     C64L            CONTINUE LOOP                         00 00071
000032 000025 R
000033 034046 A    72 C64LX   LDX     C64SGF          AB NORMALIZED                         00 00072
000034 001040 A    73         JXZ     *+3             NEGATIVE ?                            00 00073
000035 000037 R
000036 005211 A    74         CPA                     YES. 1-COMPLEMENT A                   00 00074
000037 054034 A    75         STA     C64D+1                                                00 00075
000040 064034 A    76         STB     C64D+2          STORE RESULT IN D                     00 00076
000041 014035 A    77         LDA     C64E                                                  00 00077
000042 005211 A    78         CPA                     GET EXPONENT                          00 00078
000043 054027 A    79         STA     C64D            STORE IN D                            00 00079
000044 002000 A    80 C64X    CALL    $ZF             GET AC = C64D                         00 00080
000045 000000 E
000046 000073 R    81         PZE     C64D                                                  00 00081
            82 ********                                                                     00 00082
            83 * EXIT *                                                                     00 00083
            84 ********                                                                     00 00084
000047 034034 A    86 C64Z    LDX     C64SVX          RESTORE X                             00 00086
000050 001000 A    87         JMP     0               EXIT                                  00 00087
000051 000000 A
            88 *********                                                                    00 00088
            89 * ENTRY *                                                                    00 00089
            90 *********                                                                    00 00090
000051     92 $4C     BES                                                                   00 00092
000052 074031 A    93         STX     C64SVX          SAVE X                                00 00093
000053 001000 A    94         JMP     C64             JUMP BACK FOR FORWARD REF             00 00094
000054 000000 R
            95 ******************                                                           00 00095
            96 * SET D = 0.0D0 *                                                           00 00096
```

```
                    97 ******************                                                    00 00097
000055 005001 A     99 C64ZER TZA                                                          00 00099
000056 054014 A    100       STA     C64D       SET D = 0.0D0                             00 00100
000057 054014 A    101       STA     C64D+1                                               00 00101
000060 054014 A    102       STA     C64D+2                                               00 00102
000061 001000 A    103       JMP     C64X       EXIT                                      00 00103
000062 000044 R
                   104 ****************                                                    00 00104
                   105 * I = MAX NEG *                                                    00 00105
                   106 ****************                                                    00 00106
000063 014017 A    108 C64MN LDA     C64MXN     LOAD D WITH EQUIV OF MAX NEG I            00 00108
000064 054006 A    109       STA     C64D                                                 00 00109
000065 010457 A    110       LDA     BR14                                                 00 00110
000066 054005 A    111       STA     C64D+1                                               00 00111
000067 005001 A    112       TZA                                                          00 00112
000070 054004 A    113       STA     C64D+2                                               00 00113
000071 001000 A    114       JMP     C64X       EXIT                                      00 00114
000072 000044 R
000073 000000 A    115 C64D  DATA    0,0,0,0    D                                         00 00115
000074 000000 A
000075 000000 A
000076 000000 A
000077 000000 A    116 C64E  DATA    0          EXPONENT                                  00 00116
000100 177560 A    117 C64E1 DATA    0177560    1-WORD EXPONENT                           00 00117
000101 177541 A    118 C64E2 DATA    0177541    2-WORD EXPONENT                           00 00118
000102 000000 A    119 C64SGF DATA   0          SIGN FLAG                                 00 00119
000103 000237 A    120 C64MXN DATA   0237       EXPONENT OF MAX NEG I                     00 00120
000104 000000 A    121 C64SVX DATA   0          SAVE X                                    00 00121
                   122       END                                                          00 00122
ENTRY NAMES
000051 R $4C
EXTERNAL NAMES
000045 E $ZF     000000 E AC      000010 E XDCO
SYMBOLS
000051 R $4C     000045 E $ZF     000000 E AC      000000 A ASET
000457 A BR14    000000 R C64     000023 R C641    000073 R C64D
000077 R C64E    000100 R C64E1   000101 R C64E2   000025 R C64L
000033 R C64LX   000063 R C64MN   000103 R C64MXN 000102 R C64SGF
000104 R C64SVX  000044 R C64X    000047 R C64Z    000055 R C64ZER
000420 A MT      000001 A VORTEX  000001 A X       000010 E XDCO
   0 ERRORS ASSEMBLY COMPLETE


  92  $4C          3    24
   0  $ZF         30    80
   0  AC          31
  38  ASET        68
  40  BR14       110
  47  C64         94
  61  C641        55
 115  C64D        57    75    76    79    81   100   101   102   109
                 111   113
 116  C64E        62    70    77
 117  C64E1       59
 118  C64E2       61
  68  C64L        71
  72  C64LX       68
 108  C64MN       54
 120  C64MXN     108
 119  C64SGF      52    72
 121  C64SVX      86    93
  80  C64X       103   114
  99  C64ZER      56
  39  MT          40
   0  XDCO        32    53
```

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE           00 00002
             3 *                                                                                00 00003
             4 *    V.D.M. PART NO.                                                             00 00004
             5 *                                  RELEASED                                      00 00005
             6 *                                                                                00 00006
             7 *        V$8F     LOAD COMPLEX                                                   00 00007
             8 *        V$8S     STORE COMPLEX                                                  00 00008
             9 *        V$8G     LOAD/STORE COMPLEX                                             00 00009
            10 *                                                                                00 00010
            11         TITLE    V$8G                                                           00 00011
            12 *                                                                                00 00012
            13 FSE     MAC                           PARAMETER TRANSFER                       00 00013
            14         IFT      VORTEX-2                                                       00 00014
            15         IFF      VORTEX-4                                                       00 00015
            16         GOTO     FRMWR1                                                         00 00016
            17         EXT      $SE                                                            00 00017
            18         CALL     $SE                                                            00 00018
            19         GOTO     FRMWR2                                                         00 00019
            20 FRMWR1  CONT                                                                    00 00020
            21         DATA     0105036                                                        00 00021
            22 FRMWR2  CONT                                                                    00 00022
            23         DATA     P(1)                                                           00 00023
            24         BSS      P(1)                                                           00 00024
            25         EMAC                                                                    00 00025
            26         NAME     $8S          STORE COMPLEX ACCUMULATOR                         00 00026
            27         NAME     $8F          LOAD COMPLEX ACCUMULATOR                          00 00027
            28         NAME     $8G          LOAD/STORE COMPLEX ACCUMULATOR                    00 00028
            29         EXT      $CAC                                                           00 00029
            30         EJEC                                                                    00 00030
            31 ************************************************************************       00 00031
            32 *                                                                             *  00 00032
            33 *      L O A D / S T O R E  C O M P L E X  A C C U M U L A T O R              *  00 00033
            34 *                                                                             *  00 00034
            35 *                          ( $ 8 G )                                          *  00 00035
            36 *                                                                             *  00 00036
            37 *                                                                             *  00 00037
            38 *  FUNCTION:  TO LOAD OR STORE THE COMPLEX ACCUMULATOR CAC, WHERE:            *  00 00038
            39 *                                                                             *  00 00039
            40 *               CAC(REAL)       = REGISTERS AB                                *  00 00040
            41 *               CAC(IMAGINARY)  = VARIABLE R                                  *  00 00041
            42 *                                                                             *  00 00042
            43 *                                                                             *  00 00043
            44 *  ENTRY:  NO SPECIAL CONDITIONS                                              *  00 00044
            45 *                                                                             *  00 00045
            46 *                                                                             *  00 00046
            47 *  CALLING SEQUENCE:  FORTRAN:  CALL $8G(M,Z)                                 *  00 00047
            48 *                     DAS:       PZE  M                                       *  00 00048
            49 *                                PZE  Z                                       *  00 00049
            50 *                          M=0:  LOAD CAC FROM Z                              *  00 00050
            51 *                          M=1:  STORE CAC IN Z                               *  00 00051
            52 *                                                                             *  00 00052
            53 *                                                                             *  00 00053
            54 *  EXIT :  M=0: CAC=Z                                                        *  00 00054
            55 *          M=1: Z=CAC                                                         *  00 00055
            56 *                                                                             *  00 00056
            57 *                                                                             *  00 00057
            58 ************************************************************************       00 00058
000000 034016 A  59 C8G010 LDX      C8G000-2      FETCH CONDITION ADDR                         00 00059
000001 015000 A  60        LDA      0,1           AND CONDITION                                00 00060
000002 034010 A  61        LDX      $8G           SET RETURN                                   00 00061
000003 074036 A  62        STX      $8S                                                        00 00062
000004 074060 A  63        STX      $8F                                                        00 00063
000005 034012 A  64        LDX      C8G000-1      FETCH COMPLEX ADDR                           00 00064
000006 001010 A  65        JAZ      C8S020        GO LOAD                                      00 00065
000007 000053 R
000010 014064 A  66        LDA      C8A           RESTORE A FOR STORE                          00 00066
000011 001000 A  67        JMP      C8S020        GO STORE                                     00 00067
000012 000026 R
000013 000000 A  68 $8G    ENTR                   ENTRY                                        00 00068
                 69        FSE      2             FETCH CONDITION AND ADDR                     00 00069
000014 002000 A
000015 000000 E
000016 000002 A
000021 074054 A  70 C8G000 STX      C8X           SAVE X                                       00 00070
000022 054052 A  71        STA      C8A           SAVE A                                       00 00071
000023 001000 A  72        JMP      C8G010        GO TEST CONDITION                            00 00072
000024 000000 R
                 73        EJEC                                                               00 00073
                 74 ************************************************************************       00 00074
                 75 *                                                                             *  00 00075
                 76 *      S T O R E  C O M P L E X  A C C U M U L A T O R  ( $ 8 S )              *  00 00076
                 77 *                                                                             *  00 00077
                 78 *                                                                             *  00 00078
                 79 *  FUNCTION:  TO STORE THE COMPLEX CONSTANT CONTAINED IN THE COMPLEX           *  00 00079
                 80 *             ACCUMULATOR CAC INTO LOCATION Z.                                *  00 00080
                 81 *                                                                             *  00 00081
                 82 *                                                                             *  00 00082
                 83 *  ENTRY:  CAC = COMPLEX CONSTANT                                             *  00 00083
                 84 *                                                                             *  00 00084
                 85 *                                                                             *  00 00085
                 86 *  CALLING SEQUENCE:  FORTRAN:  CALL $8S(Z)                                   *  00 00086
                 87 *                                                                             *  00 00087
```

```
                    68 *                        DAS:    JMPM $8S                                                *00 00088
                    89 *                                PZE  Z                                                  *00 00089
                    90 *                                                                                        *00 00090
                    91 *                                                                                        *00 00091
                    92 *  EXIT :  Z = CAC                                                                       *00 00092
                    93 *                                                                                        *00 00093
                    94 *                                                                                        *00 00094
                    95 ********************************************************************************       *00 00095
000025 034020 A     96 C8S010 LDX     C8S000-1      FE*TCH ADDR OF STORAGE                                      00 00096
000026 055000 A     97 C8S020 STA     0,1           STORE REAL                                                  00 00097
000027 065001 A     98        STB     1,1                                                                       00 00098
000030 006020 A     99        LDBI    $CAC          STORE COMPLEX                                               00 00099
000031 000000 E
000032 016000 A    100        LDA     0,2                                                                       00 00100
000033 055002 A    101        STA     2,1                                                                       00 00101
000034 016001 A    102        LDA     1,2                                                                       00 00102
000035 055003 A    103        STA     3,1                                                                       00 00103
000036 015000 A    104        LDA     0,1           (RESTORE REAL)                                              00 00104
000037 025001 A    105        LDB     1,1                                                                       00 00105
000040 034035 A    106        LDX     C8X           RESTORE X                                                   00 00106
000041 001000 A    107        JMP     $8S           EXIT                                                        00 00107
000042 000042 R
000042             108 $8S    BES     0             ENTRY                                                       00 00108
                   109        FSE     1             FETCH STORAGE ADDR                                          00 00109
000043 002000 A
000044 000015 E
000045 000001 A
000047 074026 A    110 C8S000 STX     C8X           SAVE X                                                      00 00110
000050 001000 A    111        JMP     C8S010        EXIT                                                        00 00111
000051 000025 R
                   112        EJEC                                                                            00 00112
                   113 ********************************************************************************       *00 00113
                   114 *                                                                                      *00 00114
                   115 *      L O A D  C O M P L E X  A C C U M U L A T O R  ( $ 8 F )                         *00 00115
                   116 *                                                                                      *00 00116
                   117 *                                                                                      *00 00117
                   118 *  FUNCTION:  TO LOAD THE COMPLEX ACCUMULATOR CAC WITH THE COMPLEX                     *00 00118
                   119 *             CONSTANT AT LOCATION Z.                                                  *00 00119
                   120 *                                                                                      *00 00120
                   121 *                                                                                      *00 00121
                   122 *  ENTRY:  Z = COMPLEX CONSTANT                                                        *00 00122
                   123 *                                                                                      *00 00123
                   124 *                                                                                      *00 00124
                   125 *  CALLING SEQUENCE:  FORTRAN:  CALL $8F(Z)                                            *00 00125
                   126 *                                                                                      *00 00126
                   127 *                      DAS:     JMPM $8F                                               *00 00127
                   128 *                               PZE  Z                                                 *00 00128
                   129 *                                                                                      *00 00129
                   130 *                                                                                      *00 00130
                   131 *  EXIT :  CAC = Z                                                                     *00 00131
                   132 *                                                                                      *00 00132
                   133 *                                                                                      *00 00133
                   134 ********************************************************************************       *00 00134
000052 034016 A    135 C8F010 LDX     C8F000-1      FETCH ADDR OF COMPLEX                                       00 00135
000053 015002 A    136 C8F020 LDA     2,1           FETCH IMAGINARY                                             00 00136
000054 006020 A    137        LDBI    $CAC                                                                      00 00137
000055 000031 E
000056 056000 A    138        STA     0,2                                                                       00 00138
000057 015003 A    139        LDA     3,1                                                                       00 00139
000060 056001 A    140        STA     1,2                                                                       00 00140
000061 015000 A    141        LDA     0,1           FETCH REAL                                                  00 00141
000062 025001 A    142        LDB     1,1                                                                       00 00142
000063 034012 A    143        LDX     C8X           RESTORE X                                                   00 00143
000064 001000 A    144        JMP     $8F           EXIT                                                        00 00144
000065 000065 R
000065             145 $8F    BES     0             ENTRY                                                       00 00145
                   146        FSE     1             FETCH COMPLEX ADDR                                          00 00146
000066 002000 A
000067 000044 E
000070 000001 A
000072 074003 A    147 C8F000 STX     C8X           SAVE X                                                      00 00147
000073 001000 A    148        JMP     C8F010                                                                    00 00148
000074 000052 R
000075             150 C8A    BSS     1             TEMP A                                                      00 00150
000076             151 C8X    BSS     1             TEMP X                                                      00 00151
                   152        END                                                                             00 00152
ENTRY NAMES
000065 R $8F     000013 R $8G     000042 R $8S
EXTERNAL NAMES
000055 E $CAC    000067 E $SE
SYMBOLS
000065 R $8F     000013 R $8G     000042 R $8S     000055 E $CAC
000067 E $SE     000075 R C8A     000072 R C8F000  000052 R C8F010
000053 R C8F020  000021 R C8G000  000000 R C8G010  000047 R C8S000
000025 R C8S010  000026 R C8S020  000076 R C8X     000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE


  145  $8F        27     63    144
   68  $8G        28     61
  108  $8S        26     62    107
    0  $CAC       29     99    137
    0  $SE        17     18
```

```
150   C8A         66     71
147   C8F000     135
135   C8F010     148
136   C8F020      65
 70   C8G000      59     64
 59   C8G010      72
110   C8S000      96
 96   C8S010     111
 97   C8S020      67
151   C8X         70    106    110    143    147
 20   FRMWR1      16
 22   FRMWR2      19
  0   P           23     24
  0   V$8G        11
  1   VORTEX      14     15
```

```
000001 A     1 VORTEX SET     1                                                                    00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE             00 00002
             3 *                                                                                  00 00003
             4 *    V.D.M. PART NO.                                                               00 00004
             5 *                                RELEASED                                          00 00005
             6 *                                                                                  00 00006
             7         TITLE   CSQRT                                                              00 00007
             8 *                                                                                  00 00008
             9 FSE     MAC                                                                        00 00009
            10         IFT     VORTEX-2                                                           00 00010
            11         IFF     VORTEX-4                                                           00 00011
            12         GOTO    FRMWR1                                                             00 00012
            13         EXT     $SE                                                                00 00013
            14         CALL    $SE                                                                00 00014
            15         GOTO    FRMWR2                                                             00 00015
            16 FRMWR1  CONT                                                                       00 00016
            17         DATA    0105036                                                            00 00017
            18 FRMWR2  CONT                                                                       00 00018
            19         DATA    P(1)                                                               00 00019
            20         BSS     P(1)                                                               00 00020
            21         EMAC                                                                       00 00021
            23 FST     MAC                                                                        00 00023
            24         IFT     VORTEX-1                                                           00 00024
            25         GOTO    FRMWR1                                                             00 00025
            26         STX     *+6             SOFTWARE STORE                                     00 00026
            27         LDXI    P(1)                                                               00 00027
            28         STA     0,1                                                                00 00028
            29         STB     1,1                                                                00 00029
            30         LDXI    *                                                                  00 00030
            31         GOTO    FRMWR4                                                             00 00031
            32 FRMWR1  CONT                                                                       00 00032
            33         IFT     VORTEX-2                                                           00 00033
            34         GOTO    FRMWR2                                                             00 00034
            35         DATA    0105033         FIRMWARE STORE                                     00 00035
            36         GOTO    FRMWR3                                                             00 00036
            37 FRMWR2  CONT                                                                       00 00037
            38         DATA    0105600         FPP STORE                                          00 00038
            39 FRMWR3  CONT                                                                       00 00039
            40         DATA    P(1)                                                               00 00040
            41 FRMWR4  CONT                                                                       00 00041
            42         EMAC                                                                       00 00042
            43 FLD     MAC                                                                        00 00043
            44         IFT     VORTEX-1                                                           00 00044
            45         GOTO    FRMWR1                                                             00 00045
            46         STX     *+6             SOFTWARE LOAD                                      00 00046
            47         LDXI    P(1)                                                               00 00047
            48         LDA     0,1                                                                00 00048
            49         LDB     1,1                                                                00 00049
            50         LDXI    *                                                                  00 00050
            51         GOTO    FRMWR4                                                             00 00051
            52 FRMWR1  CONT                                                                       00 00052
            53         IFT     VORTEX-2                                                           00 00053
            54         GOTO    FRMWR2                                                             00 00054
            55         DATA    0105032         FIRMWARE LOAD                                      00 00055
            56         GOTO    FRMWR3                                                             00 00056
            57 FRMWR2  CONT                                                                       00 00057
            58         DATA    0105420         FPP LOAD                                           00 00058
            59 FRMWR3  CONT                                                                       00 00059
            60         DATA    P(1)                                                               00 00060
            61 FRMWR4  CONT                                                                       00 00061
            62         EMAC                                                                       00 00062
            63 FLDI    MAC                                                                        00 00063
            64         IFT     VORTEX-1                                                           00 00064
            65         GOTO    FRMWR1                                                             00 00065
            66         STX     *+6             SOFTWARE LOAD                                      00 00066
            67         LDXE    P(1)                                                               00 00067
            68         LDA     0,1                                                                00 00068
            69         LDB     1,1                                                                00 00069
            70         LDXI    *                                                                  00 00070
            71         GOTO    FRMWR4                                                             00 00071
            72 FRMWR1  CONT                                                                       00 00072
            73         IFT     VORTEX-2                                                           00 00073
            74         GOTO    FRMWR2                                                             00 00074
            75         DATA    0105032         FIRMWARE LOAD                                      00 00075
            76         GOTO    FRMWR3                                                             00 00076
            77 FRMWR2  CONT                                                                       00 00077
            78         DATA    0105420         FPP LOAD                                           00 00078
            79 FRMWR3  CONT                                                                       00 00079
            80         DATA    P(1)+0100000                                                       00 00080
            81 FRMWR4  CONT                                                                       00 00081
            82         EMAC                                                                       00 00082
            83 FSTI    MAC                                                                        00 00083
            84         IFT     VORTEX-1                                                           00 00084
            85         GOTO    FRMWR1                                                             00 00085
            86         STX     *+6                                                                00 00086
            87         LDXE    P(1)            SOFTWARE STORE                                     00 00087
            88         STA     0,1                                                                00 00088
            89         STB     1,1                                                                00 00089
            90         LDXI    *                                                                  00 00090
            91         GOTO    FRMWR4                                                             00 00091
            92 FRMWR1  CONT                                                                       00 00092
            93         IFT     VORTEX-2                                                           00 00093
            94         GOTO    FRMWR2                                                             00 00094
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```
            DATA    0105033       FIRMWARE STORE                                    00 00095
            GOTO    FRMWR3                                                          00 00096
     FRMWR2 CONT                                                                    00 00097
            DATA    0105600       FPP STORE                                         00 00098
     FRMWR3 CONT                                                                    00 00099
            DATA    P(1)+0100000                                                    00 00100
     FRMWR4 CONT                                                                    00 00101
            EMAC                                                                    00 00102
     FAD    MAC                                                                     00 00103
            IFT     VORTEX-1                                                        00 00104
            GOTO    FRMWR1                                                          00 00105
            EXT     $QK                                                             00 00106
            CALL    $QK                                                             00 00107
            GOTO    FRMWR3                                                          00 00108
     FRMWR1 CONT                                                                    00 00109
            IFT     VORTEX-2                                                        00 00110
            GOTO    FRMWR2                                                          00 00111
            DATA    0105134                                                         00 00112
            GOTO    FRMWR3                                                          00 00113
     FRMWR2 CONT                                                                    00 00114
            DATA    0105410                                                         00 00115
     FRMWR3 CONT                                                                    00 00116
            DATA    P(1)                                                            00 00117
            EMAC                                                                    00 00118
     FSB    MAC                                                                     00 00120
            IFT     VORTEX-1                                                        00 00121
            GOTO    FRMWR1                                                          00 00122
            EXT     $QL                                                             00 00123
            CALL    $QL                                                             00 00124
            GOTO    FRMWR3                                                          00 00125
     FRMWR1 CONT                                                                    00 00126
            IFT     VORTEX-2                                                        00 00127
            GOTO    FRMWR2                                                          00 00128
            DATA    0105174                                                         00 00129
            GOTO    FRMWR3                                                          00 00130
     FRMWR2 CONT                                                                    00 00131
            DATA    0105450                                                         00 00132
     FRMWR3 CONT                                                                    00 00133
            DATA    P(1)                                                            00 00134
            EMAC                                                                    00 00135
     FMU    MAC                                                                     00 00137
            IFT     VORTEX-1                                                        00 00138
            GOTO    FRMWR1                                                          00 00139
            EXT     $QM                                                             00 00140
            CALL    $QM                                                             00 00141
            GOTO    FRMWR3                                                          00 00142
     FRMWR1 CONT                                                                    00 00143
            IFT     VORTEX-2                                                        00 00144
            GOTO    FRMWR2                                                          00 00145
            DATA    0105074                                                         00 00146
            GOTO    FRMWR3                                                          00 00147
     FRMWR2 CONT                                                                    00 00148
            DATA    0105416                                                         00 00149
     FRMWR3 CONT                                                                    00 00150
            DATA    P(1)                                                            00 00151
            EMAC                                                                    00 00152
     FDV    MAC                                                                     00 00154
            IFT     VORTEX-1                                                        00 00155
            GOTO    FRMWR1                                                          00 00156
            EXT     $QN                                                             00 00157
            CALL    $QN                                                             00 00158
            GOTO    FRMWR3                                                          00 00159
     FRMWR1 CONT                                                                    00 00160
            IFT     VORTEX-2                                                        00 00161
            GOTO    FRMWR2                                                          00 00162
            DATA    0105034                                                         00 00163
            GOTO    FRMWR3                                                          00 00164
     FRMWR2 CONT                                                                    00 00165
            DATA    0105401                                                         00 00166
     FRMWR3 CONT                                                                    00 00167
            DATA    P(1)                                                            00 00168
            EMAC                                                                    00 00169
            NAME    CABS                                                            00 00171
            EXT     SQRT                                                            00 00172
            NAME    CSQRT                                                           00 00173
            EXT     $CAC                                                            00 00174
            EJEC                                                                    00 00175
     ***********************************************************************************00 00176
     *                                                                             *00 00177
     *                                                                             *00 00178
     *   NAME -      CSQRT                                                         *00 00179
     *                                                                             *00 00180
     *                                                                             *00 00181
     *   PURPOSE -   TO COMPUTE THE SQUARE ROOT OF A COMPLEX ARGUMENT              *00 00182
     *                                                                             *00 00183
     *                                                                             *00 00184
     *   CALLING SEQUENCE -  CALL CSQRT(Z)                                         *00 00185
     *                                                                             *00 00186
     *                                                                             *00 00187
     *   RESULT -    ACCZ = Z**.5                                                  *00 00188
     *                                                                             *00 00189
     *                                                                             *00 00190
     ***********************************************************************************00 00191
```

```
000000 002000 A  192 CSQ010 CALL   CABS          CALC CABS                                  00 00192
000001 000172 R
000002 100111 R  193        DATA   (CSQ000-1)*                                            00 00193
000003 054175 A  194        STA    ACCC          SAVE FOR POSSIBLE LATER USE                00 00194
000004 064175 A  195        STB    ACCC+1                                                   00 00195
                 196        FLD    ACCC          CALC REAL PART                             00 00196
000005 074005 A
000006 006030 A
000007 000201 R
000010 015000 A
000011 025001 A
000012 006030 A
000013 000012 R
                 197        FAD    (CSQ000-1)*                                            00 00197
000014 002000 A
000015 000000 E
000016 100111 R
                 198        FDV    CSQ8                                                   00 00198
000017 002000 A
000020 000000 E
000021 000206 R
                 199        FST    ACCR                                                   00 00199
000022 074005 A
000023 006030 A
000024 000203 R
000025 055000 A
000026 065001 A
000027 006030 A
000030 000027 R
000031 002000 A  200        CALL   SQRT                                                   00 00200
000032 000000 E
000033 000203 R  201        DATA   ACCR                                                   00 00201
000034 054146 A  202        STA    ACCR                                                   00 00202
000035 064146 A  203        STB    ACCR+1                                                 00 00203
000036 001010 A  204        JAZ    CSQ020        IF ZERO- IMAG=SQRT OF CABS               00 00204
000037 000072 R
000040 014050 A  205        LDA    CSQ000-1      OTHERWISE DIVIDE IMAG BY 2 AND REAL      00 00205
000041 006120 A  206        ADDI   2                                                      00 00206
000042 000002 A
000043 054141 A  207        STA    TEMP                                                   00 00207
                 208        FLDI   TEMP                                                   00 00208
000044 074005 A
000045 006037 A
000046 000205 R
000047 015000 A
000050 025001 A
000051 006030 A
000052 000051 R
                 209        FDV    CSQ2                                                   00 00209
000053 002000 A
000054 000020 E
000055 000206 R
                 210        FDV    ACCR                                                   00 00210
000056 002000 A
000057 000054 E
000060 000203 R
                 211        FST    $CAC          SAVE IMAG                                00 00211
000061 074005 A
000062 006030 A
000063 000000 E
000064 055000 A
000065 065001 A
000066 006030 A
000067 000066 R
000070 001000 A  212        JMP    CSQ030                                                 00 00212
000071 000101 R
000072 002000 A  213 CSQ020 CALL   SQRT          TAKE SQRT OF CABS                        00 00213
000073 000032 E
000074 000201 R  214        DATA   ACCC                                                   00 00214
000075 006030 A  215        LDXI   $CAC                                                   00 00215
000076 000063 E
000077 055000 A  216        STA    0,1           SAVE IMAG                                00 00216
000100 065001 A  217        STB    1,1                                                    00 00217
000101 014101 A  218 CSQ030 LDA    ACCR          SET REAL PART                            00 00218
000102 024101 A  219        LDB    ACCR+1                                                 00 00219
000103 034104 A  220        LDX    TEMPX         RESTORE X                                00 00220
000104 001000 A  221        JMP    CSQRT         EXIT                                     00 00221
000105 000105 R
000105           222 CSQRT  BES    0             ENTRY                                    00 00222
                 223        FSE    1             FETCH COMPLEX ADDR                       00 00223
000106 002000 A
000107 000000 E
000110 000001 A
000112 074075 A  224 CSQ000 STX    TEMPX                                                  00 00224
000113 001000 A  225        JMP    CSQ010                                                 00 00225
000114 000000 R
                 226        EJEC                                                          00 00226
                 227 ************************************************************************00 00227
                 228 *                                                                    *00 00228
                 229 *  NAME -      CABS                                                  *00 00229
                 230 *                                                                    *00 00230
                 231 *                                                                    *00 00231
                 232 *  PURPOSE -  TO COMPUTE THE ABSOLUTE VALUE OF A COMPLEX ARGUMENT    *00 00232
```

```
                    233 *                                                                                *00  00233
                    234 *                                                                                *00  00234
                    235 *  CALLING SEQUENCE -  CALL CABS(Z)                                              *00  00235
                    236 *                                                                                *00  00236
                    237 *                                                                                *00  00237
                    238 *  RESULT -    ACCR = /Z/                                                        *00  00238
                    239 *                                                                                *00  00239
                    240 *                                                                                *00  00240
                    241 ************************************************************************************00  00241
000115 014060 A     242 CAB010 LDA      CAB000-1       CALC IMAG ADDR                                     00  00242
000116 006120 A     243        ADDI     2                                                                 00  00243
000117 000002 A
000120 054064 A     244        STA      TEMP                                                              00  00244
                    245        FLDI     CAB000-1       IMAG SQUARE                                        00  00245
000121 074005 A
000122 006037 A
000123 000176 R
000124 015000 A
000125 025001 A
000126 006030 A
000127 000126 R
                    246        FMU      (CAB000-1)*                                                       00  00246
000130 002000 A
000131 000000 E
000132 100176 R
                    247        FST      ACCR                                                              00  00247
000133 074005 A
000134 006030 A
000135 000203 R
000136 055000 A
000137 065001 A
000140 006030 A
000141 000140 R
                    248        FLDI     TEMP           REAL SQUARE                                        00  00248
000142 074005 A
000143 006037 A
000144 000205 R
000145 015000 A
000146 025001 A
000147 006030 A
000150 000147 R
                    249        FMU      (TEMP)*                                                           00  00249
000151 002000 A
000152 000131 E
000153 100205 R
                    250        FAD      ACCR                                                              00  00250
000154 002000 A
000155 000015 E
000156 000203 R
                    251        FST      ACCR                                                              00  00251
000157 074005 A
000160 006030 A
000161 000203 R
000162 055000 A
000163 065001 A
000164 006030 A
000165 000164 R
000166 002000 A     252        CALL     SQRT           EXTRACT SQUARE ROOT                                00  00252
000167 000073 E
000170 000203 R     253        DATA     ACCR                                                              00  00253
000171 001000 A     254        JMP      CABS           EXIT                                               00  00254
000172 000172 R
000172              255 CABS   BES      0              ENTRY                                              00  00255
                    256        FSE      1              FETCH COMPLEX ADDR                                 00  00256
000173 002000 A
000174 000107 E
000175 000001 A
000177 001000 A     257 CAB000 JMP      CAB010                                                            00  00257
000200 000115 R
000201              258 ACCC   BSS      2                                                                 00  00258
000203              259 ACCR   BSS      2                                                                 00  00259
000205              260 TEMP   BSS      1                                                                 00  00260
000206 040500 A     261 CSQ2   DATA     040500,0                                                          00  00261
000207 000000 A
000210              262 TEMPX  BSS      1                                                                 00  00262
                    263        END                                                                       00  00263
ENTRY NAMES
000172 R CABS    000105 R CSQRT
EXTERNAL NAMES
000076 E $CAC    000155 E $QK     000152 E $QM     000057 E $QN
000174 E $SE     000167 E SQRT
SYMBOLS
000076 E $CAC    000155 E $QK     000152 E $QM     000057 E $QN
000174 E $SE     000201 R ACCC    000203 R ACCR    000177 R CAB000
000115 R CAB010  000172 R CABS    000112 R CSQ000  000000 R CSQ010
000072 R CSQ020  000101 R CSQ030  000206 R CSQ2    000105 R CSQRT
000167 E SQRT    000205 R TEMP    000210 R TEMPX   000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE

    0   $CAC      174    211    215
    0   $QK       106    107
    0   $QL       123    124
```

```
  0   $QM       140   141
  0   $QN       157   158
  0   $SE        13    14
###   ACCC      194   195   196   214
259   ACCR      199   201   202   203   210   218   219   247   250
                251   253
257   CAB000    242   245   246
242   CAB010    257
255   CABS      171   192   254
224   CSQ000    193   197   205
192   CSQ010    225
213   CSQ020    204
218   CSQ030    212
261   CSQ2      198   209
222   CSQRT       7   173   221
 16   FRMWR1     12    25    45    65    85   105   122   139   156
 18   FRMWR2     15    34    54    74    94   111   128   145   162
 39   FRMWR3     36    56    76    96   108   113   125   130   142
                147   159   164
 41   FRMWR4     31    51    71    91
  0   P          19    20    27    40    47    60    67    80    87
                100   117   134   151   168
  0   SQRT      172   200   213   252
260   TEMP      207   208   244   248   249
262   TEMPX     220   224
  1   VORTEX     10    11    24    33    44    53    64    73    84
                 93   104   110   121   127   138   144   155   161
```

```
000001 A     1 VORTEX SET     1                                                    00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE 00 00002
             3 *                                                                  00 00003
             4 *    V.D.M. PART NO.                                               00 00004
             5 *                          RELEASED                                00 00005
             6 *                                                                  00 00006
             7         TITLE   CRMATH                                             00 00007
             8 *                                                                  00 00008
             9 FSE     MAC                                                        00 00009
            10         IFT     VORTEX-2                                           00 00010
            11         IFF     VORTEX-4                                           00 00011
            12         GOTO    FRMWR1                                             00 00012
            13         EXT     $SE                                                00 00013
            14         CALL    $SE                                                00 00014
            15         GOTO    FRMWR2                                             00 00015
            16 FRMWR1  CONT                                                       00 00016
            17         DATA    0105036                                            00 00017
            18 FRMWR2  CONT                                                       00 00018
            19         DATA    P(1)                                               00 00019
            20         BSS     P(1)                                               00 00020
            21         EMAC                                                       00 00021
            23 FLD     MAC                                                        00 00023
            24         IFT     VORTEX-3                                           00 00024
            25         IFF     VORTEX-4                                           00 00025
            26         GOTO    FRMWR1                                             00 00026
            27         STX     *+6                                                00 00027
            28         LDXI    P(1)                                               00 00028
            29         LDA     0,1                                                00 00029
            30         LDB     1,1                                                00 00030
            31         LDXI    *                                                  00 00031
            32         GOTO    FRMWR2                                             00 00032
            33 FRMWR1  CONT                                                       00 00033
            34         DATA    0105420                                            00 00034
            35         DATA    P(1)                                               00 00035
            36 FRMWR2  CONT                                                       00 00036
            37         EMAC                                                       00 00037
            39 FST     MAC                                                        00 00039
            40         IFT     VORTEX-3                                           00 00040
            41         IFF     VORTEX-4                                           00 00041
            42         GOTO    FRMWR1                                             00 00042
            43         STX     *+6                                                00 00043
            44         LDXI    P(1)                                               00 00044
            45         STA     0,1                                                00 00045
            46         STB     1,1                                                00 00046
            47         LDXI    *                                                  00 00047
            48         GOTO    FRMWR2                                             00 00048
            49 FRMWR1  CONT                                                       00 00049
            50         DATA    0105600                                            00 00050
            51         DATA    P(1)                                               00 00051
            52 FRMWR2  CONT                                                       00 00052
            53         EMAC                                                       00 00053
            54 FAD     MAC                                                        00 00054
            55         IFT     VORTEX-1                                           00 00055
            56         GOTO    FRMWR1                                             00 00056
            57         EXT     $QK                                                00 00057
            58         CALL    $QK                                                00 00058
            59         GOTO    FRMWR3                                             00 00059
            60 FRMWR1  CONT                                                       00 00060
            61         IFT     VORTEX-2                                           00 00061
            62         GOTO    FRMWR2                                             00 00062
            63         DATA    0105134                                            00 00063
            64         GOTO    FRMWR3                                             00 00064
            65 FRMWR2  CONT                                                       00 00065
            66         DATA    0105410                                            00 00066
            67 FRMWR3  CONT                                                       00 00067
            68         DATA    P(1)                                               00 00068
            69         EMAC                                                       00 00069
            71 FSB     MAC                                                        00 00071
            72         IFT     VORTEX-1                                           00 00072
            73         GOTO    FRMWR1                                             00 00073
            74         EXT     $QL                                                00 00074
            75         CALL    $QL                                                00 00075
            76         GOTO    FRMWR3                                             00 00076
            77 FRMWR1  CONT                                                       00 00077
            78         IFT     VORTEX-2                                           00 00078
            79         GOTO    FRMWR2                                             00 00079
            80         DATA    0105174                                            00 00080
            81         GOTO    FRMWR3                                             00 00081
            82 FRMWR2  CONT                                                       00 00082
            83         DATA    0105450                                            00 00083
            84 FRMWR3  CONT                                                       00 00084
            85         DATA    P(1)                                               00 00085
            86         EMAC                                                       00 00086
            88 FMU     MAC                                                        00 00088
            89         IFT     VORTEX-1                                           00 00089
            90         GOTO    FRMWR1                                             00 00090
            91         EXT     $QM                                                00 00091
            92         CALL    $QM                                                00 00092
            93         GOTO    FRMWR3                                             00 00093
            94 FRMWR1  CONT                                                       00 00094
            95         I,T     VORTEX-2                                           00 00095
            96         GOTO    FRMWR2                                             00 00096
            97         DATA    0105074                                            00 00097
```

```
                     98        GOTO    FRMWR3                                                        00 00098
                     99 FRMWR2 CONT                                                                  00 00099
                    100        DATA    0105416                                                       00 00100
                    101 FRMWR3 CONT                                                                  00 00101
                    102        DATA    P(1)                                                          00 00102
                    103        EMAC                                                                  00 00103
                    105 FDV    MAC                                                                   00 00105
                    106        IFT     VORTEX-1                                                      00 00106
                    107        GOTO    FRMWR1                                                        00 00107
                    108        EXT     $QN                                                           00 00108
                    109        CALL    $QN                                                           00 00109
                    110        GOTO    FRMWR3                                                        00 00110
                    111 FRMWR1 CONT                                                                  00 00111
                    112        IFT     VORTEX-2                                                      00 00112
                    113        GOTO    FRMWR2                                                        00 00113
                    114        DATA    0105034                                                       00 00114
                    115        GOTO    FRMWR3                                                        00 00115
                    116 FRMWR2 CONT                                                                  00 00116
                    117        DATA    0105401                                                       00 00117
                    118 FRMWR3 CONT                                                                  00 00118
                    119        DATA    P(1)                                                          00 00119
                    120        EMAC                                                                  00 00120
                    122        NAME    $AK                                                           00 00122
                    123        NAME    $AL                                                           00 00123
                    124        NAME    $AM                                                           00 00124
                    125        NAME    $AN                                                           00 00125
                    126        EXT     $CAC                                                          00 00126
                    127        EJEC                                                                  00 00127
                    128 *********************************************************************00 00128
                    129 *                                                                   *00 00129
                    130 *                                                                   *00 00130
                    131 *   NAME -        $AK                                               *00 00131
                    132 *                                                                   *00 00132
                    133 *                                                                   *00 00133
                    134 *   PURPOSE -   TO ADD A REAL ARG. TO THE REAL PART OF THE COMPLEX ARG. *00 00134
                    135 *                                                                   *00 00135
                    136 *                                                                   *00 00136
                    137 *   CALLING SEQUENCE -  CALL $AK(R)                                 *00 00137
                    138 *                                                                   *00 00138
                    139 *                                                                   *00 00139
                    140 *   RESULT -    ACCZ = ACCZ+(R,0.)                                  *00 00140
                    141 *                                                                   *00 00141
                    142 *                                                                   *00 00142
                    143 *********************************************************************00 00143
       000000 R     144 AK010  EQU     *                                                     00 00144
                    145        IFT     VORTEX-1                                              00 00145
                    146        IFF     VORTEX-2                                              00 00146
                    147        GOTO    FRMWR1                                                00 00147
                    148        FLD     ACCR                                                  00 00148
                    149 FRMWR1 CONT                                                          00 00149
                    150        FAD     (AK000-1)*      ADD REAL PART                         00 00150
000000 002000 A
000001 000000 E
000002 100010 R
                    151        IFT     VORTEX-1                                              00 00151
                    152        IFF     VORTEX-2                                              00 00152
                    153        GOTO    FRMWR1                                                00 00153
                    154        FST     ACCR                                                  00 00154
                    155        LDA     ACCR                                                  00 00155
                    156        LDB     ACCR+1                                                00 00156
                    157 FRMWR1 CONT                                                          00 00157
000003 001000 A     158        JMP     $AK             EXIT                                  00 00158
000004 000004 R
000004              159 $AK    BES     0               ENTRY                                 00 00159
                    160        FSE     1               FETCH REAL ADDR                       00 00160
000005 002000 A
000006 000000 E
000007 000001 A
       000011 R     161 AK000  EQU     *                                                     00 00161
                    162        IFT     VORTEX-1                                              00 00162
                    163        IFF     VORTEX-2                                              00 00163
                    164        GOTO    FRMWR1                                                00 00164
                    165        STA     ACCR                                                  00 00165
                    166        STB     ACCR+1                                                00 00166
                    167 FRMWR1 CONT                                                          00 00167
000011 001000 A     168        JMP     AK010                                                 00 00168
000012 000000 R
                    169        EJEC                                                          00 00169
                    170 *********************************************************************00 00170
                    171 *                                                                   *00 00171
                    172 *                                                                   *00 00172
                    173 *   NAME -        $AL                                               *00 00173
                    174 *                                                                   *00 00174
                    175 *                                                                   *00 00175
                    176 *   PURPOSE -   TO SUBTRACT A REAL ARGUMENT FROM THE REAL PART OF THE   *00 00176
                    177 *               COMPLEX ACCUMULATOR.                                *00 00177
                    178 *                                                                   *00 00178
                    179 *                                                                   *00 00179
                    180 *   CALLING SEQUENCE -  CALL $AL(R)                                 *00 00180
                    181 *                                                                   *00 00181
                    182 *                                                                   *00 00182
                    183 *   RESULT -    ACCZ = ACCZ-(R,0.)                                  *00 00183
                    184 *                                                                   *00 00184
```

```
                    185 *                                                                                *00  00185
                    186 ***************************************************************************************00  00186
         000013 R   187 AL010   EQU     *                                                                    00  00187
                    188         IFT     VORTEX-1                                                           00  00188
                    189         IFF     VORTEX-2                                                           00  00189
                    190         GOTO    FRMWR1                                                             00  00190
                    191         FLD     ACCR                                                               00  00191
                    192 FRMWR1  CONT                                                                       00  00192
                    193         FSB     (AL000-1)*    SUBTRACT REAL PART                                   00  00193
000013 002000 A
000014 000000 E
000015 100023 R
                    194         IFT     VORTEX-1                                                           00  00194
                    195         IFF     VORTEX-2                                                           00  00195
                    196         GOTO    FRMWR1                                                             00  00196
                    197         FST     ACCR                                                               00  00197
                    198         LDA     ACCR                                                               00  00198
                    199         LDB     ACCR+1                                                             00  00199
                    200 FRMWR1  CONT                                                                       00  00200
000016 001000 A     201         JMP     $AL           EXIT                                                 00  00201
000017 000017 R
000017              202 $AL     BES     0             ENTRY                                                00  00202
                    203         FSE     1             FETCH REAL ADDR                                      00  00203
000020 002000 A
000021 000006 E
000022 000001 A
         000024 R   204 AL000   EQU     *                                                                  00  00204
                    205         IFT     VORTEX-1                                                           00  00205
                    206         IFF     VORTEX-2                                                           00  00206
                    207         GOTO    FRMWR1                                                             00  00207
                    208         STA     ACCR                                                               00  00208
                    209         STB     ACCR+1                                                             00  00209
                    210 FRMWR1  CONT                                                                       00  00210
000024 001000 A     211         JMP     AL010                                                              00  00211
000025 000013 R
                    212         EJEC                                                                       00  00212
                    213 ***************************************************************************************00  00213
                    214 *                                                                                *00  00214
                    215 *                                                                                *00  00215
                    216 *   NAME -      $AM                                                              *00  00216
                    217 *                                                                                *00  00217
                    218 *                                                                                *00  00218
                    219 *   PURPOSE -   TO MULTIPLY THE COMPLEX ACC. BY A REAL ARGUMENT.                 *00  00219
                    220 *                                                                                *00  00220
                    221 *                                                                                *00  00221
                    222 *   CALLING SEQUENCE -   CALL $AM(R)                                             *00  00222
                    223 *                                                                                *00  00223
                    224 *                                                                                *00  00224
                    225 *   RESULT -    ACCZ = ACCZ*(R,0.)                                               *00  00225
                    226 *                                                                                *00  00226
                    227 *                                                                                *00  00227
                    228 ***************************************************************************************00  00228
                    229 AM010   FLD     $CAC          MULT IMAG                                            00  00229
000026 074005 A
000027 006030 A
000030 000000 E
000031 015000 A
000032 025001 A
000033 006030 A
000034 000033 R
                    230         FMU     (AM000-1)*                                                         00  00230
000035 002000 A
000036 000000 E
000037 100066 R
                    231         FST     *CAC                                                               00  00231
000040 074005 A
000041 006030 A
000042 000030 E
000043 055000 A
000044 065001 A
000045 006030 A
000046 000045 R
                    232         FLD     ACCR          MULT REAL                                            00  00232
000047 074005 A
000050 006030 A
000051 000140 R
000052 015000 A
000053 025001 A
000054 006030 A
000055 000054 R
                    233         FMU     (AM000-1)*                                                         00  00233
000056 002000 A
000057 000036 E
000060 100066 R
                    234         IFT     VORTEX-1                                                           00  00234
                    235         IFF     VORTEX-2                                                           00  00235
                    236         GOTO    FRMWR1                                                             00  00236
                    237         FST     ACCR                                                               00  00237
                    238         LDA     ACCR                                                               00  00238
                    239         LDB     ACCR+1                                                             00  00239
                    240 FRMWR1  CONT                                                                       00  00240
000061 001000 A     241         JMP     $AM           EXIT                                                 00  00241
000062 000062 R
```

```
000062                242 $AM     BES     0               ENTRY                                   00 00242
                      243         FSE     1               FETCH MULT ADDR                         00 00243
000063 002000 A
000064 000021 E
000065 000001 A
000067 054050 A       244 AM000   STA     ACCR            SAVE REAL                               00 00244
000070 064050 A       245         STB     ACCR+1                                                  00 00245
000071 001000 A       246         JMP     AM010                                                   00 00246
000072 000026 R
                      247         EJEC                                                            00 00247
                      248 ********************************************************************** 00 00248
                      249 *                                                                      *00 00249
                      250 *                                                                      *00 00250
                      251 *  NAME -      $AN                                                     *00 00251
                      252 *                                                                      *00 00252
                      253 *                                                                      *00 00253
                      254 *  PURPOSE -  TO DIVIDE THE COMPLEX ACC. BY A REAL ARGUMENT.           *00 00254
                      255 *                                                                      *00 00255
                      256 *                                                                      *00 00256
                      257 *  CALLING SEQUENCE -  CALL $AN(R)                                     *00 00257
                      258 *                                                                      *00 00258
                      259 *                                                                      *00 00259
                      260 *  RESULT -    ACCZ = ACCZ/(R,0.)                                      *00 00260
                      261 *                                                                      *00 00261
                      262 *                                                                      *00 00262
                      263 ********************************************************************** 00 00263
                      264 AN010   FLD     $CAC            DIVIDE IMAG                             00 00264
000073 074005 A
000074 006030 A
000075 000042 E
000076 015000 A
000077 025001 A
000100 006030 A
000101 000100 R
                      265         FDV     (AN000-1)*                                              00 00265
000102 002000 A
000103 000000 E
000104 100133 R
                      266         FST     $CAC                                                    00 00266
000105 074005 A
000106 006030 A
000107 000075 E
000110 055000 A
000111 065001 A
000112 006030 A
000113 000112 R
                      267         FLD     ACCR            DIVIDE REAL                             00 00267
000114 074005 A
000115 006030 A
000116 000140 R
000117 015000 A
000120 025001 A
000121 006030 A
000122 000121 R
                      268         FDV     (AN000-1)*                                              00 00268
000123 002000 A
000124 000103 E
000125 100133 R
                      269         IFT     VORTEX-1                                                00 00269
                      270         IFF     VORTEX-2                                                00 00270
                      271         GOTO    FRMWR1                                                  00 00271
                      272         FST     ACCR                                                    00 00272
                      273         LDA     ACCR                                                    00 00273
                      274         LDB     ACCR+1                                                  00 00274
                      275 FRMWR1  CONT                                                            00 00275
000126 001000 A       276         JMP     $AN             EXIT                                    00 00276
000127 000127 R
000127                277 $AN     BES     0               ENTRY                                   00 00277
                      278         FSE     1               FETCH DIVISOR ADDR                      00 00278
000130 002000 A
000131 000064 E
000132 000001 A
000134 054003 A       279 AN000   STA     ACCR            SAVE REAL                               00 00279
000135 064003 A       280         STB     ACCR+1                                                  00 00280
000136 001000 A       281         JMP     AN010                                                   00 00281
000137 000073 R
000140                282 ACCR    BSS     2                                                       00 00282
                      283         END                                                             00 00283
ENTRY NAMES
000004 R $AK     000017 R $AL     000062 R $AM     000127 R $AN
EXTERNAL NAMES
000107 E $CAC    000001 E $QK     000014 E $QL     000057 E $QM
000124 E $QN     000131 E $SE
SYMBOLS
000004 R $AK     000017 R $AL     000062 R $AM     000127 R $AN
000107 E $CAC    000001 E $QK     000014 E $QL     000057 E $QM
000124 E $QN     000131 E $SE     000140 R ACCR    000011 R AK000
000000 R AK010   000024 R AL000   000013 R AL010   000067 R AM000
000026 R AM010   000134 R AN000   000073 R AN010   000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE

  159  $AK      122   158
```

202	$AL	123	201							
242	$AM	124	241							
277	$AN	125	276							
0	$CAC	126	229	231	264	266				
0	$QK	57	58							
0	$QL	74	75							
0	$QM	91	92							
0	$QN	108	109							
0	$SE	13	14							
282	ACCR	148	154	155	156	165	166	191	197	198
		199	208	209	232	237	238	239	244	245
		267	272	273	274	279	280			
161	AK000	150								
144	AK010	168								
204	AL000	193								
187	AL010	211								
244	AM000	230	233							
229	AM010	246								
279	AN000	265	268							
264	AN010	281								
0	CRMATH	7								
16	FRMWR1	12	26	42	56	73	90	107	147	153
		164	190	196	207	236	271			
18	FRMWR2	15	32	48	62	79	96	113		
67	FRMWR3	59	64	76	81	93	98	110	115	
0	P	19	20	28	35	44	51	68	85	102
		119								
1	VORTEX	10	11	24	25	40	41	55	61	72
		78	89	95	106	112	145	146	151	152
		162	163	188	189	194	195	205	206	234
		235	269	270						

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE           00 00002
             3 *                                                                                00 00003
             4 *    V.D.M. PART NO.                                                             00 00004
             5 *                                  RELEASED                                      00 00005
             6 *                                                                                00 00006
             7          TITLE   CSINCCOS                                                        00 00007
             8 *                                                                                00 00008
             9 FSE      MAC                                                                     00 00009
            10          IFT     VORTEX-2                                                        00 00010
            11          IFF     VORTEX-4                                                        00 00011
            12          GOTO    FRMWR1                                                          00 00012
            13          EXT     $SE                                                             00 00013
            14          CALL    $SE                                                             00 00014
            15          GOTO    FRMWR2                                                          00 00015
            16 FRMWR1   CONT                                                                    00 00016
            17          DATA    0105036                                                         00 00017
            18 FRMWR2   CONT                                                                    00 00018
            19          DATA    P(1)                                                            00 00019
            20          BSS     P(1)                                                            00 00020
            21          EMAC                                                                    00 00021
            23 FST      MAC                                                                     00 00023
            24          IFT     VORTEX-1                                                        00 00024
            25          GOTO    FRMWR1                                                          00 00025
            26          STX     *+6             SOFTWARE STORE                                  00 00026
            27          LDXI    P(1)                                                            00 00027
            28          STA     0,1                                                             00 00028
            29          STB     1,1                                                             00 00029
            30          LDXI    *                                                               00 00030
            31          GOTO    FRMWR4                                                          00 00031
            32 FRMWR1   CONT                                                                    00 00032
            33          IFT     VORTEX-2                                                        00 00033
            34          GOTO    FRMWR2                                                          00 00034
            35          DATA    0105033         FIRMWARE STORE                                  00 00035
            36          GOTO    FRMWR3                                                          00 00036
            37 FRMWR2   CONT                                                                    00 00037
            38          DATA    0105600         FPP STORE                                       00 00038
            39 FRMWR3   CONT                                                                    00 00039
            40          DATA    P(1)                                                            00 00040
            41 FRMWR4   CONT                                                                    00 00041
            42          EMAC                                                                    00 00042
            43 FLD      MAC                                                                     00 00043
            44          IFT     VORTEX-1                                                        00 00044
            45          GOTO    FRMWR1                                                          00 00045
            46          STX     *+6             SOFTWARE LOAD                                   00 00046
            47          LDXI    P(1)                                                            00 00047
            48          LDA     0,1                                                             00 00048
            49          LDB     1,1                                                             00 00049
            50          LDXI    *                                                               00 00050
            51          GOTO    FRMWR4                                                          00 00051
            52 FRMWR1   CONT                                                                    00 00052
            53          IFT     VORTEX-2                                                        00 00053
            54          GOTO    FRMWR2                                                          00 00054
            55          DATA    0105032         FIRMWARE LOAD                                   00 00055
            56          GOTO    FRMWR3                                                          00 00056
            57 FRMWR2   CONT                                                                    00 00057
            58          DATA    0105420         FPP LOAD                                        00 00058
            59 FRMWR3   CONT                                                                    00 00059
            60          DATA    P(1)                                                            00 00060
            61 FRMWR4   CONT                                                                    00 00061
            62          EMAC                                                                    00 00062
            63 FLDI     MAC                                                                     00 00063
            64          IFT     VORTEX-1                                                        00 00064
            65          GOTO    FRMWR1                                                          00 00065
            66          STX     *+6             SOFTWARE LOAD                                   00 00066
            67          LDXE    P(1)                                                            00 00067
            68          LDA     0,1                                                             00 00068
            69          LDB     1,1                                                             00 00069
            70          LDXI    *                                                               00 00070
            71          GOTO    FRMWR4                                                          00 00071
            72 FRMWR1   CONT                                                                    00 00072
            73          IFT     VORTEX-2                                                        00 00073
            74          GOTO    FRMWR2                                                          00 00074
            75          DATA    0105032         FIRMWARE LOAD                                   00 00075
            76          GOTO    FRMWR3                                                          00 00076
            77 FRMWR2   CONT                                                                    00 00077
            78          DATA    0105420         FPP LOAD                                        00 00078
            79 FRMWR3   CONT                                                                    00 00079
            80          DATA    P(1)+0100000                                                    00 00080
            81 FRMWR4   CONT                                                                    00 00081
            82          EMAC                                                                    00 00082
            83 FSTI     MAC                                                                     00 00083
            84          IFT     VORTEX-1                                                        00 00084
            85          GOTO    FRMWR1                                                          00 00085
            86          STX     *+6                                                             00 00086
            87          LDXE    P(1)            SOFTWARE STORE                                  00 00087
            88          STA     0,1                                                             00 00088
            89          STB     1,1                                                             00 00089
            90          LDXI    *                                                               00 00090
            91          GOTO    FRMWR4                                                          00 00091
            92 FRMWR1   CONT                                                                    00 00092
            93          IFT     VORTEX-2                                                        00 00093
            94          GOTO    FRMWR2                                                          00 00094
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                 95          DATA    0105033         FIRMWARE STORE                                  00 00095
                 96          GOTO    FRMWR3                                                          00 00096
                 97 FRMWR2   CONT                                                                    00 00097
                 98          DATA    0105600         FPP STORE                                       00 00098
                 99 FRMWR3   CONT                                                                    00 00099
                100          DATA    P(1)+0100000                                                    00 00100
                101 FRMWR4   CONT                                                                    00 00101
                102          EMAC                                                                    00 00102
                103 FAD      MAC                                                                     00 00103
                104          IFT     VORTEX-1                                                        00 00104
                105          GOTO    FRMWR1                                                          00 00105
                106          EXT     $QK                                                             00 00106
                107          CALL    $QK                                                             00 00107
                108          GOTO    FRMWR3                                                          00 00108
                109 FRMWR1   CONT                                                                    00 00109
                110          IFT     VORTEX-2                                                        00 00110
                111          GOTO    FRMWR2                                                          00 00111
                112          DATA    0105134                                                         00 00112
                113          GOTO    FRMWR3                                                          00 00113
                114 FRMWR2   CONT                                                                    00 00114
                115          DATA    0105410                                                         00 00115
                116 FRMWR3   CONT                                                                    00 00116
                117          DATA    P(1)                                                            00 00117
                118          EMAC                                                                    00 00118
                120 FSB      MAC                                                                     00 00120
                121          IFT     VORTEX-1                                                        00 00121
                122          GOTO    FRMWR1                                                          00 00122
                123          EXT     $QL                                                             00 00123
                124          CALL    $QL                                                             00 00124
                125          GOTO    FRMWR3                                                          00 00125
                126 FRMWR1   CONT                                                                    00 00126
                127          IFT     VORTEX-2                                                        00 00127
                128          GOTO    FRMWR2                                                          00 00128
                129          DATA    0105174                                                         00 00129
                130          GOTO    FRMWR3                                                          00 00130
                131 FRMWR2   CONT                                                                    00 00131
                132          DATA    0105450                                                         00 00132
                133 FRMWR3   CONT                                                                    00 00133
                134          DATA    P(1)                                                            00 00134
                135          EMAC                                                                    00 00135
                137 FMU      MAC                                                                     00 00137
                138          IFT     VORTEX-1                                                        00 00138
                139          GOTO    FRMWR1                                                          00 00139
                140          EXT     $QM                                                             00 00140
                141          CALL    $QM                                                             00 00141
                142          GOTO    FRMWR3                                                          00 00142
                143 FRMWR1   CONT                                                                    00 00143
                144          IFT     VORTEX-2                                                        00 00144
                145          GOTO    FRMWR2                                                          00 00145
                146          DATA    0105074                                                         00 00146
                147          GOTO    FRMWR3                                                          00 00147
                148 FRMWR2   CONT                                                                    00 00148
                149          DATA    0105416                                                         00 00149
                150 FRMWR3   CONT                                                                    00 00150
                151          DATA    P(1)                                                            00 00151
                152          EMAC                                                                    00 00152
                154 FDV      MAC                                                                     00 00154
                155          IFT     VORTEX-1                                                        00 00155
                156          GOTO    FRMWR1                                                          00 00156
                157          EXT     $QN                                                             00 00157
                158          CALL    $QN                                                             00 00158
                159          GOTO    FRMWR3                                                          00 00159
                160 FRMWR1   CONT                                                                    00 00160
                161          IFT     VORTEX-2                                                        00 00161
                162          GOTO    FRMWR2                                                          00 00162
                163          DATA    0105034                                                         00 00163
                164          GOTO    FRMWR3                                                          00 00164
                165 FRMWR2   CONT                                                                    00 00165
                166          DATA    0105401                                                         00 00166
                167 FRMWR3   CONT                                                                    00 00167
                168          DATA    P(1)                                                            00 00168
                169          EMAC                                                                    00 00169
                171          NAME    CCOS                                                            00 00171
                172          NAME    CSIN                                                            00 00172
                173          EXT     COS                                                             00 00173
                174          EXT     SIN                                                             00 00174
                175          EXT     EXP                                                             00 00175
                176          EXT     $CACT                                                           00 00176
                177          EXT     $CAC                                                            00 00177
                178          EJEC                                                                    00 00178
                179 ************************************************************************************00 00179
                180 *                                                                                *00 00180
                181 *                                                                                *00 00181
                182 *   NAME -      CCOS                                                             *00 00182
                183 *                                                                                *00 00183
                184 *                                                                                *00 00184
                185 *   PURPOSE -   TO COMPUTE THE COSINE OF A COMPLEX ARGUMENT.                     *00 00185
                186 *                                                                                *00 00186
                187 *                                                                                *00 00187
                188 *   CALLING SEQUENCE -   CALL CCOS(Z)                                            *00 00188
                189 *                                                                                *00 00189
                190 *                                                                                *00 00190
                191 *   RESULT -    ACCZ = CCOS(Z)                                                   *00 00191
```

```
                    192 *                                                                                *00 00192
                    193 *                                                                                *00 00193
                    194 ************************************************************************************00 00194
                    195 CCS010 FLDI    CCS000-1      ADD MAGIC CONSTANT                                    00 00195
000000 074005 A
000001 006037 A
000002 000053 R
000003 015000 A
000004 025001 A
000005 006030 A
000006 000005 R
                    196        FAD     CCSCON                                                             00 00196
000007 002000 A
000010 000000 E
000011 000062 R
                    197        FST     ACCC                                                               00 00197
000012 074005 A
000013 006030 A
000014 000056 R
000015 055000 A
000016 065001 A
000017 006030 A
000020 000017 R
000021 014031 A     198        LDA     CCS000-1      FETCH IMAGINARY                                      00 00198
000022 006120 A     199        ADDI    2                                                                  00 00199
000023 000002 A
000024 054206 A     200        STA *   TEMP                                                               00 00200
                    201        FLDI    TEMP                                                               00 00201
000025 074005 A
000026 006037 A
000027 000233 R
000030 015000 A
000031 025001 A
000032 006030 A
000033 000032 R
                    202        FST     ACCC+2                                                             00 00202
000034 074005 A
000035 006030 A
000036 000060 R
000037 055000 A
000040 065001 A
000041 006030 A
000042 000041 R
000043 002000 A     203        CALL    CSIN          GET SIN                                              00 00203
000044 000212 R
000045 000056 R     204        DATA    ACCC                                                               00 00204
000046 001000 A     205        JMP     CCDS          EXIT                                                 00 00205
000047 000047 R
000047              206 CCDS   BES     0             ENTRY                                                00 00206
                    207        FSE     1             FETCH COMPLEX ADDR                                   00 00207
000050 002000 A
000051 000000 E
000052 000001 A
000054 001000 A     208 CCS000 JMP     CCS010                                                             00 00208
000055 000000 R
000056              209 ACCC   BSS     4                                                                  00 00209
000062 040344 A     210 CCSCON DATA    040344,041767 1.5707963267                                         00 00210
000063 041767 A
                    211        EJEC                                                                       00 00211
                    212 ************************************************************************************00 00212
                    213 *                                                                                *00 00213
                    214 *                                                                                *00 00214
                    215 *  NAME -      CSIN                                                              *00 00215
                    216 *                                                                                *00 00216
                    217 *                                                                                *00 00217
                    218 *  PURPOSE -   TO COMPUTE THE SINE OF A COMPLEX ARGUMENT.                        *00 00218
                    219 *                                                                                *00 00219
                    220 *                                                                                *00 00220
                    221 *  CALLING SEQUENCE -  CALL CSIN(Z)                                              *00 00221
                    222 *                                                                                *00 00222
                    223 *                                                                                *00 00223
                    224 *  RESULT -    ACCZ = CSIN(Z)                                                    *00 00224
                    225 *                                                                                *00 00225
                    226 *                                                                                *00 00226
                    227 ************************************************************************************00 00227
000064 014131 A     228 CSN010 LDA     CSN000-1      CALC IMAG ADDR                                       00 00228
000065 006120 A     229        ADDI    2                                                                  00 00229
000066 000002 A
000067 054143 A     230        STA     TEMP                                                               00 00230
000070 002000 A     231        CALL    EXP           CALC INITIAL VALUES                                  00 00231
000071 000000 E
000072 100233 R     232        DATA    (TEMP)*                                                            00 00232
000073 054125 A     233        STA     ETY                                                                00 00233
000074 064125 A     234        STB     ETY+1                                                              00 00234
                    235        FLD     CSN1                                                               00 00235
000075 074005 A
000076 006030 A
000077 000223 R
000100 015000 A
000101 025001 A
000102 006030 A
000103 000102 R
                    236        FDV     ETY                                                                00 00236
```

```
000104 002000 A
000105 000000 E
000106 000221 R
                    237         FST     ETMY                                    00 00237
000107 074005 A
000110 006030 A
000111 000227 R
000112 055000 A
000113 065001 A
000114 006030 A
000115 000114 R
                    238         FLD     ETY                                     00 00238
000116 074005 A
000117 006030 A
000120 000221 R
000121 015000 A
000122 025001 A
000123 006030 A
000124 000123 R
                    239         FSB     ETMY                                    00 00239
000125 002000 A
000126 000000 E
000127 000227 R
                    240         FST     $CACT                                   00 00240
000130 074005 A
000131 006030 A
000132 000000 E
000133 055000 A
000134 065001 A
000135 006030 A
000136 000135 R
000137 002000 A     241         CALL    COS             CALC IMAGINARY          00 00241
000140 000000 E
000141 100216 R     242         DATA    (CSN000-1)*                             00 00242
                    243         IFT     VORTEX-1                                00 00243
                    244         IFF     VORTEX-2                                00 00244
                    245         GOTO    FRMWR1                                  00 00245
                    246         STA     ACCR                                    00 00246
                    247         STB     ACCR+1                                  00 00247
                    248         FLD     ACCR                                    00 00248
                    249 FRMWR1  CONT                                            00 00249
                    250         FMU     $CACT                                   00 00250
000142 002000 A
000143 000000 E
000144 000132 E
                    251         FDV     CSN2                                    00 00251
000145 002000 A
000146 000105 E
000147 000225 R
                    252         FST     $CAC                                    00 00252
000150 074005 A
000151 006030 A
000152 000000 E
000153 055000 A
000154 065001 A
000155 006030 A
000156 000155 R
                    253         FLD     ETY             CALC REAL               00 00253
000157 074005 A
000160 006030 A
000161 000221 R
000162 015000 A
000163 025001 A
000164 006030 A
000165 000164 R
                    254         FAD     ETMY                                    00 00254
000166 002000 A
000167 000010 E
000170 000227 R
                    255         FST     $CACT                                   00 00255
000171 074005 A
000172 006030 A
000173 000144 E
000174 055000 A
000175 065001 A
000176 006030 A
000177 000176 R
000200 002000 A     256         CALL    SIN                                     00 00256
000201 000000 E
000202 100216 R     257         DATA    (CSN000-1)*                             00 00257
                    258         IFT     VORTEX-1                                00 00258
                    259         IFF     VORTEX-2                                00 00259
                    260         GOTO    FRMWR1                                  00 00260
                    261         STA     ACCR                                    00 00261
                    262         STB     ACCR+1                                  00 00262
                    263         FLD     ACCR                                    00 00263
                    264 FRMWR1  CONT                                            00 00264
                    265         FMU     $CACT                                   00 00265
000203 002000 A
000204 000143 E
000205 000173 E
                    266         FDV     CSN2                                    00 00266
000206 002000 A
```

```
000207 000146 E
000210 000225 R
                    267          IFT     VORTEX-1                                        00 00267
                    268          IFF     VORTEX-2                                        00 00268
                    269          GOTO    FRMWR1                                          00 00269
                    270          FST     ACCR                                            00 00270
                    271          LDA     ACCR                                            00 00271
                    272          LDB     ACCR+1                                          00 00272
                    273 FRMWR1   CONT                                                    00 00273
000211 001000 A     274          JMP     CSIN        EXIT                                00 00274
000212 000212 R
000212              275 CSIN     BES     0           ENTRY                               00 00275
                    276          FSE     1           FETCH COMPLEX ADDR                  00 00276
000213 002000 A
000214 000051 E
000215 000001 A
000217 001000 A     277 CSN000   JMP     CSN010                                          00 00277
000220 000064 R
000221              278 ETY      BSS     2                                               00 00278
000223 040300 A     279 CSN1     DATA    040300,0                                        00 00279
000224 000000 A
000225 040500 A     280 CSN2     DATA    040500,0                                        00 00280
000226 000000 A
000227              281 ETMY     BSS     2                                               00 00281
000231              282 ACCR     BSS     2                                               00 00282
000233              283 TEMP     BSS     1                                               00 00283
                    284          END                                                     00 00284
ENTRY NAMES
000047 R CCOS    000212 R CSIN
EXTERNAL NAMES
000152 E $CAC    000205 E $CACT   000167 E $QK     000126 E $QL
000204 E $QM     000207 E $QN     000214 E $SE     000140 E COS
000071 E EXP     000201 E SIN
SYMBOLS
000152 E $CAC    000205 E $CACT   000167 E $QK     000126 E $QL
000204 E $QM     000207 E $QN     000214 E $SE     000056 R ACCC
000231 R ACCR    000047 R CCOS    000054 R CCS000  000000 R CCS010
000062 R CCSCON  000140 E COS     000212 R CSIN    000217 R CSN000
000064 R CSN010  000223 R CSN1    000225 R CSN2    000227 R ETMY
000221 R ETY     000071 E EXP     000201 E SIN     000233 R TEMP
000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE


    0   $CAC      177   252
    0   $CACT     176   240   250   255   265
    0   $QK       106   107
    0   $QL       123   124
    0   $QM       140   141
    0   $QN       157   158
    0   $SE        13    14
  209   ACCC      197   202   204
  282   ACCR      246   247   248   261   262   263   270   271   272
  206   CCOS      171   205
  208   CCS000    195   198
  195   CCS010    208
  210   CCSCON    196
    0   COS       173   241
  275   CSIN      172   203   274
    0   CSINCC      7
  277   CSN000    228   242   257
  228   CSN010    277
  279   CSN1      235
  280   CSN2      251   266
  281   ETMY      237   239   254
  278   ETY       233   234   236   238   253
    0   EXP       175   231
   16   FRMWR1     12    25    45    65    85   105   122   139   156
             245   260   269
   18   FRMWR2     15    34    54    74    94   111   128   145   162
   39   FRMWR3     36    56    76    96   108   113   125   130   142
             147   159   164
   41   FRMWR4     31    51    71    91
    0   P          19    20    27    40    47    60    67    80    87
             100   117   134   151   168
    0   SIN       174   256
  283   TEMP      200   201   230   232
    1   VORTEX     10    11    24    33    44    53    64    73    84
              93   104   110   121   127   138   144   155   161
             243   244   258   259   267   268
```

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE           00 00002
             3 *                                                                                00 00003
             4 *    V.D.M. PART NO.                                                             00 00004
             5 *                                RELEASED                                        00 00005
             6 *                                                                                00 00006
             7          TITLE   CLOGCEXP                                                        00 00007
             8 *                                                                                00 00008
             9 FSE      MAC                                                                     00 00009
            10          IFT     VORTEX-2                                                        00 00010
            11          IFF     VORTEX-4                                                        00 00011
            12          GOTO    FRMWR1                                                          00 00012
            13          EXT     $SE                                                             00 00013
            14          CALL    $SE                                                             00 00014
            15          GOTO    FRMWR2                                                          00 00015
            16 FRMWR1   CONT                                                                    00 00016
            17          DATA    0105036                                                         00 00017
            18 FRMWR2   CONT                                                                    00 00018
            19          DATA    P(1)                                                            00 00019
            20          BSS     P(1)                                                            00 00020
            21          EMAC                                                                    00 00021
            23 FST      MAC                                                                     00 00023
            24          IFT     VORTEX-1                                                        00 00024
            25          GOTO    FRMWR1                                                          00 00025
            26          STX     *+6             SOFTWARE STORE                                  00 00026
            27          LDXI    P(1)                                                            00 00027
            28          STA     0,1                                                             00 00028
            29          STB     1,1                                                             00 00029
            30          LDXI    *                                                               00 00030
            31          GOTO    FRMWR4                                                          00 00031
            32 FRMWR1   CONT                                                                    00 00032
            33          IFT     VORTEX-2                                                        00 00033
            34          GOTO    FRMWR2                                                          00 00034
            35          DATA    0105033         FIRMWARE STORE                                  00 00035
            36          GOTO    FRMWR3                                                          00 00036
            37 FRMWR2   CONT                                                                    00 00037
            38          DATA    0105600         FPP STORE                                       00 00038
            39 FRMWR3   CONT                                                                    00 00039
            40          DATA    P(1)                                                            00 00040
            41 FRMWR4   CONT                                                                    00 00041
            42          EMAC                                                                    00 00042
            43 FLD      MAC                                                                     00 00043
            44          IFT     VORTEX-1                                                        00 00044
            45          GOTO    FRMWR1                                                          00 00045
            46          STX     *+6             SOFTWARE LOAD                                   00 00046
            47          LDXI    P(1)                                                            00 00047
            48          LDA     0,1                                                             00 00048
            49          LDB     1,1                                                             00 00049
            50          LDXI    *                                                               00 00050
            51          GOTO    FRMWR4                                                          00 00051
            52 FRMWR1   CONT                                                                    00 00052
            53          IFT     VORTEX-2                                                        00 00053
            54          GOTO    FRMWR2                                                          00 00054
            55          DATA    0105032         FIRMWARE LOAD                                   00 00055
            56          GOTO    FRMWR3                                                          00 00056
            57 FRMWR2   CONT                                                                    00 00057
            58          DATA    0105420         FPP LOAD                                        00 00058
            59 FRMWR3   CONT                                                                    00 00059
            60          DATA    P(1)                                                            00 00060
            61 FRMWR4   CONT                                                                    00 00061
            62          EMAC                                                                    00 00062
            63 FLDI     MAC                                                                     00 00063
            64          IFT     VORTEX-1                                                        00 00064
            65          GOTO    FRMWR1                                                          00 00065
            66          STX     *+6             SOFTWARE LOAD                                   00 00066
            67          LDXE    P(1)                                                            00 00067
            68          LDA     0,1                                                             00 00068
            69          LDB     1,1                                                             00 00069
            70          LDXI    *                                                               00 00070
            71          GOTO    FRMWR4                                                          00 00071
            72 FRMWR1   CONT                                                                    00 00072
            73          IFT     VORTEX-2                                                        00 00073
            74          GOTO    FRMWR2                                                          00 00074
            75          DATA    0105032         FIRMWARE LOAD                                   00 00075
            76          GOTO    FRMWR3                                                          00 00076
            77 FRMWR2   CONT                                                                    00 00077
            78          DATA    0105420         FPP LOAD                                        00 00078
            79 FRMWR3   CONT                                                                    00 00079
            80          DATA    P(1)+0100000                                                    00 00080
            81 FRMWR4   CONT                                                                    00 00081
            82          EMAC                                                                    00 00082
            83 FSTI     MAC                                                                     00 00083
            84          IFT     VORTEX-1                                                        00 00084
            85          GOTO    FRMWR1                                                          00 00085
            86          STX     *+6                                                             00 00086
            87          LDXE    P(1)            SOFTWARE STORE                                  00 00087
            88          STA     0,1                                                             00 00088
            89          STB     1,1                                                             00 00089
            90          LDXI    *                                                               00 00090
            91          GOTO    FRMWR4                                                          00 00091
            92 FRMWR1   CONT                                                                    00 00092
            93          IFT     VORTEX-2                                                        00 00093
            94          GOTO    FRMWR2                                                          00 00094
```

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                95          DATA    0105033         FIRMWARE STORE                                  00 00095
                96          GOTO    FRMWR3                                                          00 00096
                97 FRMWR2   CONT                                                                    00 00097
                98          DATA    0105600         FPP STORE                                       00 00098
                99 FRMWR3   CONT                                                                    00 00099
               100          DATA    P(1)+0100000                                                    00 00100
               101 FRMWR4   CONT                                                                    00 00101
               102          EMAC                                                                    00 00102
               103 FAD      MAC                                                                     00 00103
               104          IFT     VORTEX-1                                                        00 00104
               105          GOTO    FRMWR1                                                          00 00105
               106          EXT     $QK                                                             00 00106
               107          CALL    $QK                                                             00 00107
               108          GOTO    FRMWR3                                                          00 00108
               109 FRMWR1   CONT                                                                    00 00109
               110          IFT     VORTEX-2                                                        00 00110
               111          GOTO    FRMWR2                                                          00 00111
               112          DATA    0105134                                                         00 00112
               113          GOTO    FRMWR3                                                          00 00113
               114 FRMWR2   CONT                                                                    00 00114
               115          DATA    0105410                                                         00 00115
               116 FRMWR3   CONT                                                                    00 00116
               117          DATA    P(1)                                                            00 00117
               118          EMAC                                                                    00 00118
               120 FSB      MAC                                                                     00 00120
               121          IFT     VORTEX-1                                                        00 00121
               122          GOTO    FRMWR1                                                          00 00122
               123          EXT     $QL                                                             00 00123
               124          CALL    $QL                                                             00 00124
               125          GOTO    FRMWR3                                                          00 00125
               126 FRMWR1   CONT                                                                    00 00126
               127          IFT     VORTEX-2                                                        00 00127
               128          GOTO    FRMWR2                                                          00 00128
               129          DATA    0105174                                                         00 00129
               130          GOTO    FRMWR3                                                          00 00130
               131 FRMWR2   CONT                                                                    00 00131
               132          DATA    0105450                                                         00 00132
               133 FRMWR3   CONT                                                                    00 00133
               134          DATA    P(1)                                                            00 00134
               135          EMAC                                                                    00 00135
               137 FMU      MAC                                                                     00 00137
               138          IFT     VORTEX-1                                                        00 00138
               139          GOTO    FRMWR1                                                          00 00139
               140          EXT     $QM                                                             00 00140
               141          CALL    $QM                                                             00 00141
               142          GOTO    FRMWR3                                                          00 00142
               143 FRMWR1   CONT                                                                    00 00143
               144          IFT     VORTEX-2                                                        00 00144
               145          GOTO    FRMWR2                                                          00 00145
               146          DATA    0105074                                                         00 00146
               147          GOTO    FRMWR3                                                          00 00147
               148 FRMWR2   CONT                                                                    00 00148
               149          DATA    0105416                                                         00 00149
               150 FRMWR3   CONT                                                                    00 00150
               151          DATA    P(1)                                                            00 00151
               152          EMAC                                                                    00 00152
               154 FDV      MAC                                                                     00 00154
               155          IFT     VORTEX-1                                                        00 00155
               156          GOTO    FRMWR1                                                          00 00156
               157          EXT     $QN                                                             00 00157
               158          CALL    $QN                                                             00 00158
               159          GOTO    FRMWR3                                                          00 00159
               160 FRMWR1   CONT                                                                    00 00160
               161          IFT     VORTEX-2                                                        00 00161
               162          GOTO    FRMWR2                                                          00 00162
               163          DATA    0105034                                                         00 00163
               164          GOTO    FRMWR3                                                          00 00164
               165 FRMWR2   CONT                                                                    00 00165
               166          DATA    0105401                                                         00 00166
               167 FRMWR3   CONT                                                                    00 00167
               168          DATA    P(1)                                                            00 00168
               169          EMAC                                                                    00 00169
               171          NAME    CLOG                                                            00 00171
               172          NAME    CEXP                                                            00 00172
               173          EXT     $CAC                                                            00 00173
               174          EXT     ATAN2                                                           00 00174
               175          EXT     ALOG                                                            00 00175
               176          EXT     EXP                                                             00 00176
               177          EXT     SIN                                                             00 00177
               178          EXT     COS                                                             00 00178
               179          EJEC                                                                    00 00179
               180 ************************************************************************        00 00180
               181 *                                                                               *00 00181
               182 *                                                                               *00 00182
               183 *   NAME -      CLOG                                                            *00 00183
               184 *                                                                               *00 00184
               185 *                                                                               *00 00185
               186 *   PURPOSE -   TO COMPUTE THE NATURAL LOGARITHM OF A COMPLEX ARGUMENT.         *00 00186
               187 *                                                                               *00 00187
               188 *                                                                               *00 00188
               189 *   CALLING SEQUENCE -  CALL CLOG(Z)                                            *00 00189
               190 *                                                                               *00 00190
               191 *                                                                               *00 00191
```

```
                    192 *  RESULT -   ACCZ = CLOG(Z)                                                    *00 00192
                    193 *                                                                               *00 00193
                    194 *                                                                               *00 00194
                    195 ************************************************************************************00 00195
000000 014074 A     196 CLG010 LDA     CLG000-1                                                          00 00196
000001 006120 A     197        ADDI    2                                                                 00 00197
000002 000002 A
000003 054144 A     198        STA     TEMP                                                              00 00198
000004 002000 A     199        CALL    ATAN2          CALCULATE IMAGINARY                                00 00199
000005 000000 E
000006 100150 R     200        DATA    (TEMP)*                                                           00 00200
000007 100075 R     201        DATA    (CLG000-1)*                                                       00 00201
000010 006030 A     202        LDXI    $CAC                                                              00 00202
000011 000000 E
000012 055000 A     203        STA     0,1                                                               00 00203
000013 065001 A     204        STB     1,1                                                               00 00204
                    205        FLDI    TEMP           NOW REAL (REAL*REAL)                               00 00205
000014 074005 A
000015 006037 A
000016 000150 R
000017 015000 A
000020 025001 A
000021 006030 A
000022 000021 R
                    206        FMU     (TEMP)*                                                           00 00206
000023 002000 A
000024 000000 E
000025 100150 R
                    207        FST     ACCR                                                              00 00207
000026 074005 A
000027 006030 A
000030 000151 R
000031 055000 A
000032 065001 A
000033 006030 A
000034 000033 R
                    208        FLDI    CLG000-1       IMAG*IMAG                                          00 00208
000035 074005 A
000036 006037 A
  0037 000075 R
  0040 015000 A
000041 025001 A
000042 006030 A
000043 000042 R
                    209        FMU     (CLG000-1)*                                                       00 00209
000044 002000 A
000045 000024 E
000046 100075 R
                    210        FAD     ACCR                                                              00 00210
000047 002000 A
000050 000000 E
000051 000151 R
                    211        FST     ACCR                                                              00 00211
000052 074005 A
000053 006030 A
000054 000151 R
000055 055000 A
000056 065001 A
000057 006030 A
000060 000057 R
000061 002000 A     212        CALL    ALOG           LOG IT                                             00 00212
000062 000000 E
000063 000151 R     213        DATA    ACCR                                                              00 00213
                    214        IFT     VORTEX-1                                                          00 00214
                    215        IFF     VORTEX-2                                                          00 00215
                    216        GOTO    FRMWR1                                                            00 00216
                    217        STA     ACCR                                                              00 00217
                    218        STB     ACCR+1                                                            00 00218
                    219        FLD     ACCR                                                              00 00219
                    220 FRMWR1 CONT                                                                      00 00220
                    221        FDV     CLG2           DIVIDE BY 2                                        00 00221
000064 002000 A
000065 000000 E
000066 000101 R
                    222        IFT     VORTEX-1                                                          00 00222
                    223        IFF     VORTEX-2                                                          00 00223
                    224        GOTO    FRMWR1                                                            00 00224
                    225        FST     ACCR                                                              00 00225
                    226        LDA     ACCR                                                              00 00226
                    227        LDB     ACCR+1                                                            00 00227
                    228 FRMWR1 CONT                                                                      00 00228
000067 034013 A     229        LDX     TEMPX          RESTORE X                                          00 00229
000070 001000 A     230        JMP     CLOG           EXIT                                               00 00230
000071 000071 R
000071              231 CLOG   BES     0              ENTRY                                              00 00231
                    232        FSE     1              FETCH COMPLEX ADDR                                 00 00232
  0072 002000 A
  0073 000000 E
000074 000001 A
000076 074004 A     233 CLG000 STX     TEMPX          SAVE X                                             00 00233
000077 001000 A     234        JMP     CLG010                                                            00 00234
000100 000000 R
000101 040500 A     235 CLG2   DATA    040500,0                                                          00 00235
```

```
000102 000000 A
000103              236 TEMPX  BSS     1                                                    00 00236
                    237        EJEC                                                      00 00237
                    238 ********************************************************************00 00238
                    239 *                                                                  *00 00239
                    240 *                                                                  *00 00240
                    241 *  NAME -      CEXP                                               *00 00241
                    242 *                                                                  *00 00242
                    243 *                                                                  *00 00243
                    244 *  PURPOSE -  TO COMPUTE THE EXPONENTIAL, BASE E, OF A COMPLEX NO. *00 00244
                    245 *                                                                  *00 00245
                    246 *                                                                  *00 00246
                    247 *  CALLING SEQUENCE -  CALL CEXP(Z)                                *00 00247
                    248 *                                                                  *00 00248
                    249 *                                                                  *00 00249
                    250 *  RESULT -   ACCZ = E**Z                                          *00 00250
                    251 *                                                                  *00 00251
                    252 *                                                                  *00 00252
                    253 ********************************************************************00 00253
000104 002000 A     254 CXP010 CALL    EXP             EXPONENTIATE                       00 00254
000105 000000 E
000106 100145 R     255        DATA    (CXP000-1)*                                        00 00255
000107 054041 A     256        STA     ACCR                                               00 00256
000110 064041 A     257        STB     ACCR+1                                             00 00257
000111 014033 A     258        LDA     CXP000-1        SET IMAG ADDR                      00 00258
000112 006120 A     259        ADDI    2                                                  00 00259
000113 000002 A
000114 054033 A     260        STA     TEMP                                               00 00260
000115 002000 A     261        CALL    SIN             USE SIN FOR IMAG                   00 00261
000116 000000 E
000117 100150 R     262        DATA    (TEMP)*                                            00 00262
                    263        IFT     VORTEX-1                                           00 00263
                    264        IFF     VORTEX-2                                           00 00264
                    265        GOTO    FRMWR1                                             00 00265
                    266        STA     ACCC                                               00 00266
                    267        STB     ACCC+1                                             00 00267
                    268        FLD     ACCC                                               00 00268
                    269 FRMWR1 CONT                                                       00 00269
                    270        FMU     ACCR                                               00 00270
000120 002000 A
000121 000045 E
000122 000151 R
                    271        FST     $CAC                                               00 00271
000123 074005 A
000124 006030 A
000125 000011 E
000126 055000 A
000127 065001 A
000130 006030 A
000131 000130 R
000132 002000 A     272        CALL    COS             USE COS FOR REAL                   00 00272
000133 000000 E
000134 100150 R     273        DATA    (TEMP)*                                            00 00273
                    274        IFT     VORTEX-1                                           00 00274
                    275        IFF     VORTEX-2                                           00 00275
                    276        GOTO    FRMWR1                                             00 00276
                    277        STA     ACCC                                               00 00277
                    278        STB     ACCC+1                                             00 00278
                    279        FLD     ACCC                                               00 00279
                    280 FRMWR1 CONT                                                       00 00280
                    281        FMU     ACCR                                               00 00281
000135 002000 A
000136 000121 E
000137 000151 R
                    282        IFT     VORTEX-1                                           00 00282
                    283        IFF     VORTEX-2                                           00 00283
                    284        GOTO    FRMWR1                                             00 00284
                    285        FST     ACCR                                               00 00285
                    286        LDA     ACCR                                               00 00286
                    287        LDB     ACCR+1                                             00 00287
                    288 FRMWR1 CONT                                                       00 00288
000140 001000 A     289        JMP     CEXP            EXIT                               00 00289
000141 000141 R
000141              290 CEXP   BES     0               ENTRY                              00 00290
                    291        FSE     1               FETCH COMPLEX ADDR                 00 00291
000142 002000 A
000143 000073 E
000144 000001 A
000146 001000 A     292 CXP000 JMP     CXP010                                             00 00292
000147 000104 R
000150              293 TEMP   BSS     1                                                  00 00293
000151              294 ACCR   BSS     2                                                  00 00294
000153              295 ACCC   BSS     2                                                  00 00295
                    296        END                                                        00 00296
ENTRY NAMES
000141 R CEXP    000071 R CLOG
EXTERNAL NAMES
000125 E $CAC    000050 E $QK     000136 E $QM     000065 E $QN
000143 E $SE     000062 E ALOG    000005 E ATAN2   000133 E COS
000105 E EXP     000116 E SIN
SYMBOLS
000125 E $CAC    000050 E $QK     000136 E $QM     000065 E $QN
000143 E $SE     000153 R ACCC    000151 R ACCR    000062 E ALOG
```

```
000005 E ATAN2  000141 R CEXP   000076 R CLG000 000000 R CLG010
000101 R CLG2   000071 R CLOG   000133 E COS    000146 R CXP000
000104 R CXP010 000105 E EXP    000116 E SIN    000150 R TEMP
000103 R TEMPX  000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE

    0   $CAC      173   202   271
    0   $QK       106   107
    0   $QL       123   124
    0   $QM       140   141
    0   $QN       157   158
    0   $SE        13    14
  295   ACCC      266   267   268   277   278   279
  294   ACCR      207   210   211   213   217   218   219   225   226
                  227   256   257   270   281   285   286   287
    0   ALOG      175   212
    0   ATAN2     174   199
  290   CEXP      172   289
  233   CLG000    196   201   208   209
  196   CLG010    234
  235   CLG2      221
  231   CLOG      171   230
    0   CLOGCE      7
    0   COS       178   272
  292   CXP000    255   258
  254   CXP010    292
    0   EXP       176   254
   16   FRMWR1     12    25    45    65    85   105   122   139   156
                  216   224   265   276   284
   18   FRMWR2     15    34    54    74    94   111   128   145   162
   39   FRMWR3     36    56    76    96   108   113   125   130   142
                  147   159   164
   41   FRMWR4     31    51    71    91
    0   P          19    20    27    40    47    60    67    80    87
                  100   117   134   151   168
    0   SIN       177   261
  293   TEMP      198   200   205   206   260   262   273
  236   TEMPX     229   233
    1   VORTEX     10    11    24    33    44    53    64    73    84
                   93   104   110   121   127   138   144   155   161
                  214   215   222   223   263   264   274   275   282
                  283
```

```
000001 A     1 VORTEX SET     1                                                                  00 00001
             2 * THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1975 BY VARIAN DATA MACHINE           00 00002
             3 *                                                                                00 00003
             4 *    V.D.M. PART NO.                                                             00 00004
             5 *                              RELEASED                                          00 00005
             6 *                                                                                00 00006
             7          TITLE    CCMATH                                                        00 00007
             8 *                                                                                00 00008
             9 FSE      MAC                                                                    00 00009
            10          IFT      VORTEX-2                                                      00 00010
            11          IFF      VORTEX-4                                                      00 00011
            12          GOTO     FRMWR1                                                        00 00012
            13          EXT      $SE                                                           00 00013
            14          CALL     $SE                                                           00 00014
            15          GOTO     FRMWR2                                                        00 00015
            16 FRMWR1   CONT                                                                   00 00016
            17          DATA     0105036                                                       00 00017
            18 FRMWR2   CONT                                                                   00 00018
            19          DATA     P(1)                                                          00 00019
            20          BSS      P(1)                                                          00 00020
            21          EMAC                                                                   00 00021
            23 FST      MAC                                                                    00 00023
            24          IFT      VORTEX-1                                                      00 00024
            25          GOTO     FRMWR1                                                        00 00025
            26          STX      *+6             SOFTWARE STORE                                00 00026
            27          LDXI     P(1)                                                          00 00027
            28          STA      0,1                                                           00 00028
            29          STB      1,1                                                           00 00029
            30          LDXI     *                                                             00 00030
            31          GOTO     FRMWR4                                                        00 00031
            32 FRMWR1   CONT                                                                   00 00032
            33          IFT      VORTEX-2                                                      00 00033
            34          GOTO     FRMWR2                                                        00 00034
            35          DATA     0105033         FIRMWARE STORE                                00 00035
            36          GOTO     FRMWR3                                                        00 00036
            37 FRMWR2   CONT                                                                   00 00037
            38          DATA     0105600         FPP STORE                                     00 00038
            39 FRMWR3   CONT                                                                   00 00039
            40          DATA     P(1)                                                          00 00040
            41 FRMWR4   CONT                                                                   00 00041
            42          EMAC                                                                   00 00042
            43 FLD      MAC                                                                    00 00043
            44          IFT      VORTEX-1                                                      00 00044
            45          GOTO     FRMWR1                                                        00 00045
            46          STX      *+6             SOFTWARE LOAD                                 00 00046
            47          LDXI     P(1)                                                          00 00047
            48          LDA      0,1                                                           00 00048
            49          LDB      1,1                                                           00 00049
            50          LDXI     *                                                             00 00050
            51          GOTO     FRMWR4                                                        00 00051
            52 FRMWR1   CONT                                                                   00 00052
            53          IFT      VORTEX-2                                                      00 00053
            54          GOTO     FRMWR2                                                        00 00054
            55          DATA     0105032         FIRMWARE LOAD                                 00 00055
            56          GOTO     FRMWR3                                                        00 00056
            57 FRMWR2   CONT                                                                   00 00057
            58          DATA     0105420         FPP LOAD                                      00 00058
            59 FRMWR3   CONT                                                                   00 00059
            60          DATA     P(1)                                                          00 00060
            61 FRMWR4   CONT                                                                   00 00061
            62          EMAC                                                                   00 00062
            63 FLDI     MAC                                                                    00 00063
            64          IFT      VORTEX-1                                                      00 00064
            65          GOTO     FRMWR1                                                        00 00065
            66          STX      *+6             SOFTWARE LOAD                                 00 00066
            67          LDXE     P(1)                                                          00 00067
            68          LDA      0,1                                                           00 00068
            69          LDB      1,1                                                           00 00069
            70          LDXI     *                                                             00 00070
            71          GOTO     FRMWR4                                                        00 00071
            72 FRMWR1   CONT                                                                   00 00072
            73          IFT      VORTEX-2                                                      00 00073
            74          GOTO     FRMWR2                                                        00 00074
            75          DATA     0105032         FIRMWARE LOAD                                 00 00075
            76          GOTO     FRMWR3                                                        00 00076
            77 FRMWR2   CONT                                                                   00 00077
            78          DATA     0105420         FPP LOAD                                      00 00078
            79 FRMWR3   CONT                                                                   00 00079
            80          DATA     P(1)+0100000                                                  00 00080
            81 FRMWR4   CONT                                                                   00 00081
            82          EMAC                                                                   00 00082
            83 FSTI     MAC                                                                    00 00083
            84          IFT      VORTEX-1                                                      00 00084
            85          GOTO     FRMWR1                                                        00 00085
            86          STX      *+5                                                           00 00086
            87          LDXE     P(1)            SOFTWARE STORE                                00 00087
            88          STA      0,1                                                           00 00088
            89          STB      1,1                                                           00 00089
            90          LDXI     *                                                             00 00090
            91          GOTO     FRMWR4                                                        00 00091
            92 FRMWR1   CONT                                                                   00 00092
            93          IFT      VORTEX-2                                                      00 00093
            94          GOTO     FRMWR2                                                        00 00094
```

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                95          DATA    0105033         FIRMWARE STORE                                  00  00095
                96          GOTO    FRMWR3                                                          00  00096
                97 FRMWR2   CONT                                                                    00  00097
                98          DATA    0105600         FPP STORE                                       00  00098
                99 FRMWR3   CONT                                                                    00  00099
               100          DATA    P(1)+0100000                                                    00  00100
               101 FRMWR4   CONT                                                                    00  00101
               102          EMAC                                                                    00  00102
               103 FAD      MAC                                                                     00  00103
               104          IFT     VORTEX-1                                                        00  00104
               105          GOTO    FRMWR1                                                          00  00105
               106          EXT     $QK                                                             00  00106
               107          CALL    $QK                                                             00  00107
               108          GOTO    FRMWR3                                                          00  00108
               109 FRMWR1   CONT                                                                    00  00109
               110          IFT     VORTEX-2                                                        00  00110
               111          GOTO    FRMWR2                                                          00  00111
               112          DATA    0105134                                                         00  00112
               113          GOTO    FRMWR3                                                          00  00113
               114 FRMWR2   CONT                                                                    00  00114
               115          DATA    0105410                                                         00  00115
               116 FRMWR3   CONT                                                                    00  00116
               117          DATA    P(1)                                                            00  00117
               118          EMAC                                                                    00  00118
               120 FSB      MAC                                                                     00  00120
               121          IFT     VORTEX-1                                                        00  00121
               122          GOTO    FRMWR1                                                          00  00122
               123          EXT     $QL                                                             00  00123
               124          CALL    $QL                                                             00  00124
               125          GOTO    FRMWR3                                                          00  00125
               126 FRMWR1   CONT                                                                    00  00126
               127          IFT     VORTEX-2                                                        00  00127
               128          GOTO    FRMWR2                                                          00  00128
               129          DATA    0105174                                                         00  00129
               130          GOTO    FRMWR3                                                          00  00130
               131 FRMWR2   CONT                                                                    00  00131
               132          DATA    0105450                                                         00  00132
               133 FRMWR3   CONT                                                                    00  00133
               134          DATA    P(1)                                                            00  00134
               135          EMAC                                                                    00  00135
               137 FMU      MAC                                                                     00  00137
               138          IFT     VORTEX-1                                                        00  00138
               139          GOTO    FRMWR1                                                          00  00139
               140          EXT     $QM                                                             00  00140
               141          CALL    $QM                                                             00  00141
               142          GOTO    FRMWR3                                                          00  00142
               143 FRMWR1   CONT                                                                    00  00143
               144          IFT     VORTEX-2                                                        00  00144
               145          GOTO    FRMWR2                                                          00  00145
               146          DATA    0105074                                                         00  00146
               147          GOTO    FRMWR3                                                          00  00147
               148 FRMWR2   CONT                                                                    00  00148
               149          DATA    0105416                                                         00  00149
               150 FRMWR3   CONT                                                                    00  00150
               151          DATA    P(1)                                                            00  00151
               152          EMAC                                                                    00  00152
               154 FDV      MAC                                                                     00  00154
               155          IFT     VORTEX-1                                                        00  00155
               156          GOTO    FRMWR1                                                          00  00156
               157          EXT     $QN                                                             00  00157
               158          CALL    $QN                                                             00  00158
               159          GOTO    FRMWR3                                                          00  00159
               160 FRMWR1   CONT                                                                    00  00160
               161          IFT     VORTEX-2                                                        00  00161
               162          GOTO    FRMWR2                                                          00  00162
               163          DATA    0105034                                                         00  00163
               164          GOTO    FRMWR3                                                          00  00164
               165 FRMWR2   CONT                                                                    00  00165
               166          DATA    0105401                                                         00  00166
               167 FRMWR3   CONT                                                                    00  00167
               168          DATA    P(1)                                                            00  00168
               169          EMAC                                                                    00  00169
               171          NAME    $8M                                                             00  00171
               172          NAME    $8N                                                             00  00172
               173          EXT     $CAC                                                            00  00173
               174          EXT     $CACT                                                           00  00174
               175          NAME    $8K                                                             00  00175
               176          NAME    $8L                                                             00  00176
               177          EJEC                                                                    00  00177
               178 ************************************************************************************00  00178
               179 *                                                                                *00  00179
               180 *                                                                                *00  00180
               181 *   NAME-       $8K                                                              *00  00181
               182 *                                                                                *00  00182
               183 *                                                                                *00  00183
               184 *   PURPOSE -   TO ADD A COMPLEX ARGUMENT TO THE COMPLEX ACCUMULATOR             *00  00184
               185 *                                                                                *00  00185
               186 *                                                                                *00  00186
               187 *   CALLING SEQUENCE -   CALL $8K(Z)                                             *00  00187
               188 *                                                                                *00  00188
               189 *                                                                                *00  00189
               190 *   RESULT -    ACCZ = ACCZ+Z                                                    *00  00190
               191 *                                                                                *00  00191
```

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                    192 *                                                                                *00 00192
                    193 ***************************************************************************************00 00193
000000 014043 A     194 CAD010 LDA     CAD000-1       CALC IMAG OP2 ADDR                                  00 00194
000001 006120 A     195        ADDI    2                                                                  00 00195
000002 000002 A
000003 054501 A     196        STA     TEMP                                                               00 00196
                    197        FLD     $CAC           IMAG+IMAG                                           00 00197
000004 074005 A
000005 006030 A
000006 000000 E
000007 015000 A
000010 025001 A
000011 006030 A
000012 000011 R
                    198        FAD     (TEMP)*                                                            00 00198
000013 002000 A
000014 000000 E
000015 100505 R
                    199        FST     $CAC                                                               00 00199
000016 074005 A
000017 006030 A
000020 000006 E
000021 055000 A
000022 065001 A
000023 006030 A
000024 000023 R
                    200        FLD     ACCR           REAL+REAL                                           00 00200
000025 074005 A
000026 006030 A
000027 000477 R
000030 015000 A
000031 025001 A
000032 006030 A
000033 000032 R
                    201        FAD     (CAD000-1)*                                                        00 00201
000034 002000 A
000035 000014 E
000036 100044 R
                    202        IFT     VORTEX-1                                                           00 00202
                    203        IFF     VORTEX-2                                                           00 00203
                    204        GOTO    FRMWR1                                                             00 00204
                    205        FST     ACCR                                                               00 00205
                    206        LDA     ACCR                                                               00 00206
                    207        LDB     ACCR+1                                                             00 00207
                    208 FRMWR1 CONT                                                                       00 00208
000037 001000 A     209        JMP     $8K            EXIT                                                00 00209
000040 000040 R
000040              210 $8K    BES     0              ENTRY                                               00 00210
                    211        FSE     1              FETCH OP2 ADDR                                      00 00211
000041 002000 A
000042 000000 E
000043 000001 A
000045 054431 A     212 CAD000 STA     ACCR           SAVE REAL OP1                                       00 00212
000046 064431 A     213        STB     ACCR+1                                                             00 00213
000047 001000 A     214        JMP     CAD010                                                             00 00214
000050 000000 R
                    215        EJEC                                                                       00 00215
                    216 ***************************************************************************************00 00216
                    217 *                                                                                *00 00217
                    218 *                                                                                *00 00218
                    219 *  NAME -      $8L                                                               *00 00219
                    220 *                                                                                *00 00220
                    221 *                                                                                *00 00221
                    222 *  PURPOSE -  TO SUBTRACT A COMPLEX ARGUMENT FROM THE COMPLEX ACC.               *00 00222
                    223 *                                                                                *00 00223
                    224 *                                                                                *00 00224
                    225 *  CALLING SEQUENCE -  CALL $8L(Z)                                               *00 00225
                    226 *                                                                                *00 00226
                    227 *                                                                                *00 00227
                    228 *  RESULT -   ACCZ = ACCZ-Z                                                      *00 00228
                    229 *                                                                                *00 00229
                    230 *                                                                                *00 00230
                    231 ***************************************************************************************00 00231
000051 014043 A     232 CSB010 LDA     CSB000-1       CALC IMAG OP2 ADDR                                  00 00232
000052 006120 A     233        ADDI    2                                                                  00 00233
000053 000002 A
000054 054430 A     234        STA     TEMP                                                               00 00234
                    235        FLD     $CAC           IMAG-IMAG                                           00 00235
000055 074005 A
000056 006030 A
000057 000020 E
000060 015000 A
000061 025001 A
000062 006030 A
000063 000062 R
                    236        FSB     (TEMP)*                                                            00 00236
000064 002000 A
000065 000000 E
000066 100505 R
                    237        FST     $CAC                                                               00 00237
000067 074005 A
000070 006030 A
000071 000057 E
```

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000072 055000 A
000073 065001 A
000074 006030 A
000075 000074 R
                238          FLD      ACCR           REAL-REAL                                  00 00238
000076 074005 A
000077 006030 A
000100 000477 R
000101 015000 A
000102 025001 A
000103 006030 A
000104 000103 R
                239          FSB      (CSB000-1)*                                                00 00239
000105 002000 A
000106 000065 E
000107 100115 R
                240          IFT      VORTEX-1                                                   00 00240
                241          IFF      VORTEX-2                                                   00 00241
                242          GOTO     FRMWR1                                                     00 00242
                243          FST      ACCR                                                       00 00243
                244          LDA      ACCR                                                       00 00244
                245          LDB      ACCR+1                                                     00 00245
                246 FRMWR1   CONT                                                                00 00246
000110 001000 A 247          JMP      $8L            EXIT                                        00 00247
000111 000111 R
000111          248 $8L      BES      0              ENTRY                                       00 00248
                249          FSE      1              FETCH OP2 ADDR                              00 00249
000112 002000 A
000113 000042 E
000114 000001 A
000116 054360 A 250 CSB000   STA      ACCR           SAVE REAL OP1                               00 00250
000117 064360 A 251          STB      ACCR+1                                                     00 00251
000120 001000 A 252          JMP      CSB010                                                     00 00252
000121 000051 R
                253          EJEC                                                                00 00253
                254 ********************************************************************************00 00254
                255 *                                                                              *00 00255
                256 *                                                                              *00 00256
                257 *   NAME -      $8M                                                            *00 00257
                258 *                                                                              *00 00258
                259 *                                                                              *00 00259
                260 *   PURPOSE -   TO MULTIPLY THE COMPLEX ACC. BY A COMPLEX ARGUMENT             *00 00260
                261 *                                                                              *00 00261
                262 *                                                                              *00 00262
                263 *   CALLING SEQUENCE -   CALL $8M(Z)                                           *00 00263
                264 *                                                                              *00 00264
                265 *                                                                              *00 00265
                266 *   RESULT -    ACCZ = ACCZ*Z                                                  *00 00266
                267 *                                                                              *00 00267
                268 *                                                                              *00 00268
                269 ********************************************************************************00 00269
000122 014114 A 270 CMU010   LDA      CMU000-1                                                   00 00270
000123 006120 A 271          ADDI     2                                                          00 00271
000124 000002 A
000125 054357 A 272          STA      TEMP                                                       00 00272
                273          FLDI     CMU000-1       CALC IMAGINARY PART                         00 00273
000126 074005 A
000127 006037 A
000130 000237 R
000131 015000 A
000132 025001 A
000133 006030 A
000134 000133 R
                274          FMU      ACCI                                                       00 00274
000135 002000 A
000136 000000 E
000137 000503 R
                275          FST      $CACT                                                      00 00275
000140 074005 A
000141 006030 A
000142 000000 E
000143 055000 A
000144 065001 A
000145 006030 A
000146 000145 R
                276          FLDI     TEMP                                                       00 00276
000147 074005 A
000150 006037 A
000151 000505 R
000152 015000 A
000153 025001 A
000154 006030 A
000155 000154 R
                277          FMU      ACCR                                                       00 00277
000156 002000 A
000157 000136 E
000160 000477 R
                278          FAD      $CACT                                                      00 00278
000161 002000 A
000162 000035 E
000163 000142 E
                279          FST      $CAC                                                       00 00279
000164 074005 A
```

```
000165 006030 A
000166 000071 E
000167 055000 A
000170 065001 A
000171 006030 A
000172 000171 R
                280          FLDI     TEMP           CALC REAL PART                    00 00280
000173 074005 A
000174 006037 A
000175 000505 R
000176 015000 A
000177 025001 A
000200 006030 A
000201 000200 R
                281          FMU      ACCI                                             00 00281
000202 002000 A
000203 000157 E
000204 000503 R
                282          FST      $CACT                                            00 00282
000205 074005 A
000206 006030 A
000207 000163 E
000210 055000 A
000211 065001 A
000212 006030 A
000213 000212 R
                283          FLDI     CMU000-1                                         00 00283
000214 074005 A
000215 006037 A
000216 000237 R
000217 015000 A
000220 025001 A
000221 006030 A
000222 000221 R
                284          FMU      ACCR                                             00 00284
000223 002000 A
000224 000203 E
000225 000477 R
                285          FSB      $CACT                                            00 00285
000226 002000 A
000227 000106 E
000230 000207 E
                286          IFT      VORTEX-1                                         00 00286
                287          IFF      VORTEX-2                                         00 00287
                288          GOTO     FRMWR1                                           00 00288
                289          FST      ACCR                                             00 00289
                290          LDA      ACCR                                             00 00290
                291          LDB      ACCR+1                                           00 00291
                292 FRMWR1   CONT                                                      00 00292
000231 034254 A 293          LDX      TEMPX          RESTORE X                         00 00293
000232 001000 A 294          JMP      $8M            EXIT                              00 00294
000233 000233 R
000233          295 $8M      BES      0              ENTRY                             00 00295
                296          FSE      1              FETCH OP2 ADDR                    00 00296
000234 002000 A
000235 000113 E
000236 000001 A
000240 074245 A 297 CMU000   STX      TEMPX          SAVE X                            00 00297
000241 054235 A 298          STA      ACCR           SAVE REAL OP1                     00 00298
000242 064235 A 299          STB      ACCR+1                                           00 00299
                300          FLD      $CAC           SAVE IMAG OP1                     00 00300
000243 074005 A
000244 006030 A
000245 000166 E
000246 015000 A
000247 025001 A
000250 006030 A
000251 000250 R
                301          FST      ACCI                                             00 00301
000252 074005 A
000253 006030 A
000254 000503 R
000255 055000 A
000256 065001 A
000257 006030 A
000260 000257 R
000261 001000 A 302          JMP      CMU010                                           00 00302
000262 000122 R
                303          EJEC                                                      00 00303
                304 ************************************************************************00 00304
                305 *                                                                  *00 00305
                306 *                                                                  *00 00306
                307 *  NAME -      $8N                                                 *00 00307
                308 *                                                                  *00 00308
                309 *                                                                  *00 00309
                310 *  PURPOSE -  TO DIVIDE THE COMPLEX ACC. BY A COMPLEX ARGUMENT.    *00 00310
                311 *                                                                  *00 00311
                312 *                                                                  *00 00312
                313 *  CALLING SEQUENCE -  CALL $8N(Z)                                 *00 00313
                314 *                                                                  *00 00314
                315 *                                                                  *00 00315
                316 *  RESULT -    ACCZ = ACCZ/Z                                       *00 00316
                317 *                                                                  *00 00317
```

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                    318 *                                                                                *00 00318
                    319 ***************************************************************************************00 00319
000263 014167 A     320 CDV010 LDA     CDV000-1      FETCH COMPLEX ADDR                                    00 00320
000264 006120 A     321        ADDI    2                                                                   00 00321
000265 000002 A
000266 054216 A     322        STA     TEMP          SAVE IMAGINARY PART                                   00 00322
                    323        FLDI    TEMP          REAL*REAL (DP2)                                       00 00323
000267 074005 A
000270 006037 A
000271 000505 R
000272 015000 A
000273 025001 A
000274 006030 A
000275 000274 R
                    324        FMU     (TEMP)*                                                             00 00324
000276 002000 A
000277 000224 E
000300 100505 R
                    325        FST     $CACT                                                               00 00325
000301 074005 A
000302 006030 A
000303 000230 E
000304 055000 A
000305 065001 A
000306 006030 A
000307 000306 R
                    326        FLDI    CDV000-1      IMAG*IMAG (DP1)                                       00 00326
000310 074005 A
000311 006037 A
000312 000453 R
000313 015000 A
000314 025001 A
000315 006030 A
000316 000315 R
                    327        FMU     (CDV000-1)*                                                         00 00327
000317 002000 A
000320 000277 E
000321 100453 R
                    328        FAD     $CACT                                                               00 00328
000322 002000 A
000323 000162 E
000324 000303 E
                    329        FST     $CACT         SAVE DENOMINATOR                                      00 00329
000325 074005 A
000326 006030 A
000327 000324 E
000330 055000 A
000331 065001 A
000332 006030 A
000333 000332 R
                    330        FLD     ACCR          CALCULATE IMAGINARY                                   00 00330
000334 074005 A
000335 006030 A
000336 000477 R
000337 015000 A
000340 025001 A
000341 006030 A
000342 000341 R
                    331        FMU     (TEMP)*                                                             00 00331
000343 002000 A
000344 000320 E
000345 100505 R
                    332        FST     ACCT                                                                00 00332
000346 074005 A
000347 006030 A
000350 000501 R
000351 055000 A
000352 065001 A
000353 006030 A
000354 000353 R
                    333        FLDI    CDV000-1                                                            00 00333
000355 074005 A
000356 006037 A
000357 000453 R
000360 015000 A
000361 025001 A
000362 006030 A
000363 000362 R
                    334        FMU     ACCI                                                                00 00334
000364 002000 A
000365 000344 E
000366 000503 R
                    335        FSB     ACCT                                                                00 00335
000367 002000 A
000370 000227 E
000371 000501 R
                    336        FDV     $CACT                                                               00 00336
000372 002000 A
000373 000000 E
000374 000327 E
                    337        FST     $CAC          SAVE IMAGINARY                                        00 00337
000375 074005 A
000376 006030 A
```

```
000377 000245 E
000400 055000 A
000401 065001 A
000402 006030 A
000403 000402 R
                338          FLDI     CDV000-1      CALCULATE REAL                    00 00338
000404 074005 A
000405 006037 A
000406 000453 R
000407 015000 A
000410 025001 A
000411 006030 A
000412 000411 R
                339          FMU      ACCR                                            00 00339
000413 002000 A
000414 000365 E
000415 000477 R.
                340          FST      ACCR                                            00 00340
000416 074005 A
000417 006030 A
000420 000477 R
000421 055000 A
000422 065001 A
000423 006030 A
000424 000423 R
                341          FLDI     TEMP                                            00 00341
000425 074005 A
000426 006037 A
000427 000505 R
000430 015000 A
000431 025001 A
000432 006030 A
000433 000432 R
                342          FMU      ACCI                                            00 00342
000434 002000 A
000435 000414 E
000436 000503 R
                343          FAD      ACCR                                            00 00343
000437 002000 A
000440 000323 E
000441 000477 R
                344          FDV      $CACT                                           00 00344
000442 002000 A
000443 000373 E
000444 000374 E
                345          IFT      VORTEX-1                                        00 00345
                346          IFF      VORTEX-2                                        00 00346
                347          GOTO     FRMWR1                                          00 00347
                348          FST      ACCR          SAVE REAL                         00 00348
                349          LDA      ACCR                                            00 00349
                350          LDB      ACCR+1                                          00 00350
                351 FRMWR1   CONT                                                     00 00351
000445 034040 A 352          LDX      TEMPX         RESTORE X                         00 00352
000446 001000 A 353          JMP      $8N           EXIT                              00 00353
000447 000447 R
000447          354 $8N      BES      0             ENTRY                             00 00354
                355          FSE      1             FETCH COMPLEX ADDR (OP2)          00 00355
000450 002000 A
000451 000235 E
000452 000001 A
000454 074031 A 356 CDV000   STX      TEMPX         SAVE X                            00 00356
000455 054021 A 357          STA      ACCR          SAVE REAL (OP1)                   00 00357
000456 064021 A 358          STB      ACCR+1                                          00 00358
                359          FLD      $CAC          SAVE IMAGINARY (OP1)              00 00359
000457 074005 A
000460 006030 A
000461 000377 E
000462 015000 A
000463 025001 A
000464 006030 A
000465 000464 R
                360          FST      ACCI                                            00 00360
000466 074005 A
000467 006030 A
000470 000503 R
000471 055000 A
000472 065001 A
000473 006030 A
000474 000473 R
000475 001000 A 361          JMP      CDV010                                          00 00361
000476 000263 R
000477          362 ACCR     BSS      2                                               00 00362
000501          363 ACCT     BSS      2                                               00 00363
000503          364 ACCI     BSS      2                                               00 00364
000505          365 TEMP     BSS      1                                               00 00365
000506          366 TEMPX    BSS      1                                               00 00366
                367          END                                                      00 00367
ENTRY NAMES
000040 R $8K    000111 R $8L    000233 R $8M    000447 R $8N
EXTERNAL NAMES
000461 E $CAC   000444 E $CACT  000440 E $QK    000370 E $QL
000435 E $QM    000443 E $QN    000451 E $SE
SYMBOLS
```

```
000040  R $8K     000111  R $8L     000233  R $8M     000447  R $8N
000461  E $CAC    000444  E $CACT   000440  E $QK     000370  E $QL
000435  E $QM     000443  E $QN     000451  E $SE     000503  R ACCI
000477  R ACCR    000501  R ACCT    000045  R CAD000  000000  R CAD010
000454  R CDV000  000263  R CDV010  000240  R CMU000  000122  R CMU010
000116  R CSB000  000051  R CSB010  000505  R TEMP    000506  R TEMPX
000001  A VORTEX
  0 ERRORS ASSEMBLY COMPLETE
```

```
  210   $8K       175   209
  248   $8L       176   247
  295   $8M       171   294
  354   $8N       172   353
    0   $CAC      173   197   199   235   237   279   300   337   359
    0   $CACT     174   275   278   282   285   325   328   329   336
                  344
    0   $QK       106   107
    0   $QL       123   124
    0   $QM       140   141
    0   $QN       157   158
    0   $SE        13    14
  364   ACCI      274   281   301   334   342   360
  362   ACCR      200   205   206   207   212   213   238   243   244
                  245   250   251   277   284   289   290   291   298
                  299   330   339   340   343   348   349   350   357
                  358
  363   ACCT      332   335
  212   CAD000    194   201
  194   CAD010    214
    0   CCMATH      7
  356   CDV000    320   326   327   333   338
  320   CDV010    361
  297   CMU000    270   273   283
  270   CMU010    302
  250   CSB000    232   239
  232   CSB010    252
   16   FRMWR1     12    25    45    65    85   105   122   139   156
                  204   242   288   347
   18   FRMWR2     15    34    54    74    94   111   128   145   162
   39   FRMWR3     36    56    76    96   108   113   125   130   142
                  147   159   164
   41   FRMWR4     31    51    71    91
    0   P          19    20    27    40    47    60    67    80    87
                  100   117   134   151   168
  365   TEMP      196   198   234   236   272   276   280   322   323
                  324   331   341
  366   TEMPX     293   297   352   356
    1   VORTEX     10    11    24    33    44    53    64    73    84
                   93   104   110   121   127   138   144   155   161
                  202   203   240   241   286   287   345   346
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```
000001 A     1 VORTEX SET     1                                                                  01 00001
             2 *       V.D.M. PART NO.                                                          01 00002
             3 *                                                                                01 00003
             4 *                                  RELEASED                                      01 00004
             5 *                                                                                01 00005
             6 *                 DIMULDIV                                                       01 00006
             7 *                                                                                01 00007
             8         TITLE   DIMULDIV                                                         01 00008
             9 ************************************************                                 01 00009
            10                                                                                  01 00010
            11 ******************************                                                  01 00011
            12 *       DOUBLE PRECISION MULTIPLY/DIVIDE ($6M ,$6N ,$6NX )                       01 00012
            13 *                                                                               01 00013
            14 * FUNCTION: TO MULTIPLY OR DIVIDE TWO DOUBLE WORD INTEGERS                       01 00014
            15 *                                                                               01 00015
            16 * ENTRY:        $6M   FOR MULTIPLY                                              01 00016
            17 *                $6N   FOR DIVIDE (RETURN QUOTIENT)                             01 00017
            18 *                $6NX   FOR DIVIDE (RETURN REMAINDER)                           01 00018
            19 *                                                                               01 00019
            20 * CALLING SEQ: JMPM     $6M      MULTIPLY                                       01 00020
            21 *               DATA     ADDRESS OF OPERAND 2                                   01 00021
            22 *               JMPM     $6N      DIVIDE (RETURN QUOTIENT)                      01 00022
            23 *               DATA     ADDRESS OF DIVISOR                                     01 00023
            24 *               JMPM     $6NX     DIVIDE (RETURN REMAINDER)                     01 00024
            25 *               DATA     ADDRESS OF DIVISOR                                     01 00025
            26 *                                                                               01 00026
            27 * EXIT: $6M :   REGISTERS A AND B CONTAIN LEAST SIGNIFICANT TWO                  01 00027
            28 *               WORDS AND LOCATIONS MSW1 AND MSW2 CONTAIN MOST                 01 00028
            29 *               SIGNIFICANT TWO WORDS.                                         01 00029
            30 *         $6N : REGISTERS A AND B CONTAIN TWO WORD QUOTIENT.                    01 00030
            31 *       $6NX :  REGISTERS A AND B CONTAIN TWO WORD REMAINDER                    01 00031
            32 *                                                                               01 00032
            33 * ERRORS: OVERFLOW:     SET FOR $6N  OR $6NX  IF DIVISOR IS 0.                  01 00033
            34 *                       WHEN OVERFLOW IS SET BY THE ABOVE, RESULT               01 00034
            35 *                       WILL BE SET TO THE MAXIMUM POSSIBLE VALUE               01 00035
            36 *                                                                               01 00036
            37 ************************************************************************************01 00037
            38         EJEC                                                                    01 00038
            39 ***********                                                                     01 00039
            40 * ENTRIES *                                                                     01 00040
            41 ***********                                                                     01 00041
            42         NAME     $2M      DP TIMES SP INTEGER MULTIPLY ENTRY                     01 00042
            43         NAME     $2N      DP DIVIDED BY SP INTEGER ENTRY                         01 00043
            44         NAME     $2NX     DP BY SP DIVIDE (REMAINDER)                            01 00044
            45         NAME     $6M      DP INTEGER MULTIPLY ENTRY                              01 00045
            46         NAME     $6N      DP INTEGER DIVIDE ENTRY (FOUR WORD DIVIDEND)           01 00046
            47         NAME     $6NX     DP INTEGER DIVIDE ENTRY (TWO WORD DIVIDEND)            01 00047
000001 A    49 X       SET      1        X-REGISTER                                             01 00049
000002 A    50 B       SET      2        B-REGISTER                                             01 00050
            52 *************                                                                   01 00052
            53 * EXTERNALS *                                                                   01 00053
            54 *************                                                                   01 00054
            55         EXT      $6K      DOUBLE PRECISION INTEGER ADD                           01 00055
            56         EXT      $6L      DOUBLE PRECISION INTEGER SUBTRACT                      01 00056
            58 ***********                                                                     01 00058
            59 * MACROS *                                                                     01 00059
            60 ***********                                                                     01 00060
            61 FSE     MAC                                                                     01 00061
            62         IFT      VORTEX-2                                                       01 00062
            63         IFF      VORTEX-4                                                       01 00063
            64         GOTO     FRMWR1                                                         01 00064
            65         EXT      $SE                                                            01 00065
            66         CALL     $SE      XFER PARAMETERS                                       01 00066
            67         GOTO     FRMWR2                                                         01 00067
            68 FRMWR1  CONT                                                                    01 00068
            69         DATA     0105036 BCS XFER PARAMETERS                                    01 00069
            70 FRMWR2  CONT                                                                    01 00070
            71         EMAC                                                                    01 00071
            73 FLD     MAC                                                                     01 00073
            74         IFT      VORTEX-2                                                       01 00074
            75         IFF      VORTEX-4                                                       01 00075
            76         GOTO     FRMWR1                                                         01 00076
            77         LDA      P(1)     LOAD MOST SIGNIFICANT WORD                            01 00077
            78         LDB      P(1)+1   LOAD LEAST SIGNIFICANT WORD                           01 00078
            79         GOTO     FRMWR2                                                         01 00079
            80 FRMWR1  CONT                                                                    01 00080
            81         DATA     0105032 FIRMWARE TWO WORD LOAD TO A/B                          01 00081
            82         DATA     P(1)                                                           01 00082
            83 FRMWR2  CONT                                                                    01 00083
            84         EMAC                                                                    01 00084
            86 FST     MAC                                                                     01 00086
            87         IFT      VORTEX-2                                                       01 00087
            88         IFF      VORTEX-4                                                       01 00088
            89         GOTO     FRMWR1                                                         01 00089
            90         STA      P(1)     STORE MOST SIGNIFICANT WORD                           01 00090
            91         STB      P(1)+1   STORE LEAST SIGNIFICANT WORD                          01 00091
            92         GOTO     FRMWR2                                                         01 00092
            93 FRMWR1  CONT                                                                    01 00093
            94         DATA     0105033 FIRMWARE TWO WORD STORE FROM A/B                       01 00094
            95         DATA     P(1)                                                           01 00095
            96 FRMWR2  CONT                                                                    01 00096
            97         EMAC                                                                    01 00097
000000 034076 A    98 M2010   LDX      $2M      SET RETURN                                     01 00098
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000001 074064 A    99          STX     $6M                                                          01 00099
000002 006030 A   100          LDXI    SINGLE  SET PARAMETER ADDR                                   01 00100
000003 000415 R
000004 074065 A   101          STX     MUL000                                                       01 00101
000005 006037 A   102          LDXE*   M2000           FETCH INTEGER                                01 00102
000006 100103 R
000007 002000 A   103          CALL    SINSUB  BUILD NEW DP INTEGER                                 01 00103
000010 000357 R
                  104          EJEC                                                                 01 00104
                  105 *                        ISOLAT SIGN BIT OF RESULT                           01 00105
                  106 *                        AND INVERT IF NECESSARY                             01 00106
000011 005004 A   107 MUL010  TZX             INITIALIZE SIGN                                      01 00107
000012 074375 A   108          STX     SIGN                                                         01 00108
                  109 *                                  D**********************************      01 00109
                  110 *                                  * OPERAND 1  NEGATIVE?         *      01 00110
                  111 *                                  **********************************      01 00111
000013 002004 A   112          JANM    COMP    DONT INVERT IF POSITIVE                              01 00112
000014 000107 R
                  113          FST     TEMP                                                         01 00113
000015 054360 A
000016 064360 A
000017 034052 A   114          LDX     MUL000  FETCH DP2                                            01 00114
000020 015000 A   115          LDA     0,1                                                          01 00115
000021 025001 A   116          LDB     1,1                                                          01 00116
                  117 *                                  D**********************************      01 00117
                  118 *                                  *OPERAND 2 NEGATIVE?           *      01 00118
                  119 *                                  **********************************      01 00119
000022 002004 A   120          JANM    COMP    DONT INVERT IF POSITIVE                              01 00120
000023 000107 R
                  121          FST     DIVIS                                                        01 00121
000024 054354 A
000025 064354 A
                  122 *                                  P**********************************      01 00122
                  123 *                                  * CREATE FOUR WORD PRODUCT     *      01 00123
                  124 *                                  **********************************      01 00124
000026 005001 A   125          TZA                                                                  01 00125
000027 164347 A   126          MUL     TEMP+1  BEGIN MULTIPLY                                       01 00126
000030 064356 A   127          STB     LSW2    SAVE LEAST SIGNIFICANT WORD                          01 00127
000031 024344 A   128          LDB     TEMP                                                         01 00128
000032 164347 A   129          MUL     DIVIS+1                                                      01 00129
000033 054351 A   130          STA     VAL     PREPARE FOR SUMMING                                  01 00130
000034 005021 A   131          TBA                                                                  01 00131
000035 024341 A   132          LDB     TEMP+1                                                       01 00132
000036 164342 A   133          MUL     DIVIS                                                        01 00133
000037 124345 A   134          ADD     VAL     DO SUM                                               01 00134
000040 064345 A   135          STB     LSW1    SAVE NEXT LEAST SIGNIFICANT WORD                     01 00135
                  136 *                        SET CARRY FOR MOST SIGNIFICANT WORD                 01 00136
000041 005002 A   137          TZB                                                                  01 00137
000042 001002 A   138          JAP     MUL040  NO CARRY                                             01 00138
000043 000046 R
000044 154344 A   139          ANA     MASK    CLEAR SIGN BIT                                       01 00139
000045 005122 A   140          IBR             SET CARRY VALUE                                      01 00140
000046 064343 A   141 MUL040  STB     FLAG    SAVE CARRY VALUE                                     01 00141
000047 007400 A   142          ROF             NOW ALLOW FOR TRUE OVERFLOW                          01 00142
000050 024325 A   143          LDB     TEMP                                                         01 00143
000051 164327 A   144          MUL     DIVIS                                                        01 00144
000052 124337 A   145          ADD     FLAG    ADD IN CARRY                                         01 00145
000053 005034 A   146          MERG    034     IF MOST SIGNIFICANT NON ZERO, SET IN X               01 00146
000054 003046 A   147          XXNZ    MULSOF  SET OVERFLOW IF MSW NON ZERO                         01 00147
000055 000076 R
                  148          FLD     LSW1                                                         01 00148
000056 014327 A
000057 024327 A
                  149 *                        NOW TEST FOR COMPLEMENT NECESSARY                   01 00149
000060 034327 A   150          LDX     SIGN                                                         01 00150
000061 005344 A   151          DXR                                                                  01 00151
000062 002040 A   152          JXZM    COMP    COMPLIMENT RESULT                                    01 00152
000063 000107 R
000064 034327 A   153          LDX     XSAVE   RESTORE X                                            01 00153
000065 001000 A   154          JMP     0       EXIT                                                 01 00154
000066 000000 A
                  155 *                                  E**********************************      01 00155
                  156 *                                  * $6M  MULTIPLY ENTRY          *      01 00156
                  157 *                                  **********************************      01 00157
000066            158 $6M      BES     0                                                            01 00158
                  159          FSE                                                                  01 00159
000067 002000 A
000070 000000 E
000071 000001 A   160          DATA    1                                                            01 00160
000072            161 MUL000   BSS     1                                                            01 00161
000073 074320 A   162          STX     XSAVE   SAVE X                                               01 00162
000074 001000 A   163          JMP     MUL010  GO MULTIPLY                                          01 00163
000075 000011 R
000076 007401 A   164 MULSOF  SOF             SET OVERFLOW IF MSW NON ZERO                         01 00164
000077 000000 A   165 $2M      ENTR            DP BY SP MULTIPLY ENTRY                              01 00165
                  166          FSE                                                                  01 00166
000100 002000 A
000101 000070 E
000102 000001 A   167          DATA    1                                                            01 00167
000103            168 M2000    BSS     1                                                            01 00168
000104 074307 A   169          STX     XSAVE   SAVE X FOR EXIT                                      01 00169
000105 001000 A   170          JMP     M2010                                                        01 00170
000106 000000 R
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                    171          EJEC                                                                    01 00171
                    172 *                        ROUTINE TO COMPLEMENT A AND B REGISTERS                01 00172
000107 000000 A     173 COMP     ENTR                                                                    01 00173
000110 044277 A     174          INR     SIGN    INCREMENT RESULT SIGN FLAG                             01 00174
000111 001020 A     175          JBZ     CMP010  TWO'S COMPLEMENT MSW IF LSW IS ZERO                    01 00175
000112 000122 R
000113 005222 A     176          CPB             TWO'S COMPLEMENT LSW                                   01 00176
000114 005122 A     177          IBR                                                                    01 00177
000115 004041 A     178          LRLB    1       CLEAR SIGN BIT                                         01 00178
000116 004141 A     179          LSRB    1                                                              01 00179
000117 005211 A     180          CPA             ONE'S COMPLEMENT MSW                                   01 00180
000120 001000 A     181          JMP*    COMP    EXIT                                                   01 00181
000121 100107 R
000122 001010 A     182 CMP010   JAZ     CMP020  EXIT IF VALUE IS ZERO                                  01 00182
000123 000126 R
000124 005211 A     183          CPA             TWO'S COMPLEMENT MSW                                   01 00183
000125 005111 A     184          IAR                                                                    01 00184
000126 001000 A     185 CMP020   JMP*    COMP    EXIT                                                   01 00185
000127 100107 R
000130              186 CSAVE    BSS     1                                                              01 00186
                    187          EJEC                                                                   01 00187
000131 000000 A     188 $2NX     ENTR                    DP BY SP DIVIDE ENTRY (REMAINDER)              01 00188
                    189          FSE                                                                    01 00189
000132 002000 A
000133 000101 E
000134 000001 A     190          DATA    1                                                              01 00190
000135              191 N2X000   BSS     1                                                              01 00191
000136 074255 A     192          STX     XSAVE   SAVE X FOR EXIT                                       01 00192
000137 006037 A     193          LDXE    $2NX    SET RETURN                                             01 00193
000140 000131 R
000141 074033 A     194          STX     $6NX                                                           01 00194
000142 006030 A     195          LDXI    SINGLE  SET DIVISOR ADDR                                       01 00195
000143 000415 R
000144 074034 A     196          STX     D66X05                                                         01 00196
000145 006037 A     197          LDXE*   N2X000  FETCH PARAMETER                                        01 00197
000146 100135 R
000147 002000 A     198          CALL    SINSUB                                                         01 00198
000150 000357 R
000151 001000 A     199          JMP     D66X10  GO DIVIDE                                              01 00199
000152 000203 R
000153 000000 A     200 $2N      ENTR                    DP BY SP DIVIDE ENTRY (QUOTIENT)               01 00200
                    201          FSE                                                                    01 00201
000154 002000 A
000155 000133 E
000156 000001 A     202          DATA    1                                                              01 00202
000157              203 N2000    BSS     1                                                              01 00203
000160 074233 A     204          STX     XSAVE   SAVE X FOR EXIT                                       01 00204
000161 006037 A     205          LDXE    $2N     SET RETURN                                             01 00205
000162 000153 R
000163 074123 A     206          STX     $6N                                                            01 00206
000164 006030 A     207          LDXI    SINGLE  SET DIVISOR ADDR                                       01 00207
000165 000415 R
000166 074124 A     208          STX     DVD000                                                         01 00208
000167 006037 A     209          LDXE*   N2000   FETCH SINGLE                                          01 00209
000170 100157 R
000171 002000 A     210          CALL    SINSUB                                                         01 00210
000172 000357 R
000173 001000 A     211          JMP     D66001  GO DIVIDE                                              01 00211
000174 000315 R
                    212 *                                   E********************************         01 00212
                    213 *                                   * $6NX  DIVIDE WITH REMAINDER*         01 00213
                    214 *                                   ********************************         01 00214
000175 000000 A     215 $6NX     ENTR                                                                   01 00215
                    216          FSE             FETCH DP2 ADDRESS                                      01 00216
000176 002000 A
000177 000155 E
000200 000001 A     217          DATA    1                                                              01 00217
000201              218 D66X05   BSS     1                                                              01 00218
000202 074211 A     219          STX     XSAVE   SAVE X                                                 01 00219
000203 006037 A     220 D66X10   LDXE    $6NX    SET RETURN ADDRESS                                     01 00220
000204 000175 R
000205 074101 A     221          STX     $6N                                                            01 00221
                    222 *                                   P********************************         01 00222
                    223 *                                   * SET $6NX  CALLED FLAG      *         01 00223
                    224 *                                   ********************************         01 00224
000206 005104 A     225          INCR    04      SET RETURN REMAINDER FLAG                              01 00225
000207 074170 A     226          STX     DVDREM                                                         01 00226
000210 006037 A     227          LDXE    D66X05  SET ADDRESS OF DIVISOR                                 01 00227
000211 000201 R
                    229 *                        DO DIVIDE                                              01 00229
                    230 DVD010   FST     LSW1    SAVE LEAST SIGNIFICANT                                 01 00230
000212 054173 A
000213 064173 A
000214 007400 A     231          ROF             INITIALLY CLEAR OVERFLOW                               01 00231
000215 005001 A     232          TZA             INITIALIZE RESULT SIGN                                 01 00232
000216 054171 A     233          STA     SIGN                                                           01 00233
000217 015000 A     234          LDA     0,X                                                            01 00234
000220 025001 A     235          LDB     1,X     FETCH DIVISOR                                          01 00235
                    236 *                                   P********************************         01 00236
                    237 *                                   * COMPLIMENT DIVIDEND AND    *         01 00237
                    238 *                                   * DIVISOR IF NEGATIVE        *         01 00238
                    239 *                                   ********************************         01 00239
000221 002004 A     240          JANM    COMP    DONT COMPLEMENT IF POSITIVE                            01 00240
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000222 000107 R
                    241          FST     DIVIS   SAVE DIVISOR                                    01 00241
000223 054153 A
000224 064155 A
                    242          FLD     LSW1    TEST DIVIDEND SIGN                              01 00242
000225 014160 A
000226 024160 A
000227 002004 A     243          JANM    COMP    DONT COMPLEMET IF POSITIVE                      01 00243
000230 000107 R
                    244          FST     LSW1    SAVE COMPLEMENTED DIVIDEND                      01 00244
000231 054154 A
000232 064154 A
000233 014145 A     245          LDA     DIVIS   TEST FOR INTEGER DIVIDE                        01 00245
                    246 *                                D**********************************   01 00246
                    247 *                                * DIVISOR MSW ZERO?             *   01 00247
                    248 *                                **********************************   01 00248
000234 001010 A     249          JAZ     DVDINT  YES, GO DO SINGLE PRECISION                     01 00249
000235 000327 R
                    250 *                                P**********************************   01 00250
                    251 *                                * DIVIDE                        *   01 00251
                    252 *                                **********************************   01 00252
000236 005001 A     253          TZA             NO, DO DOUBLE                                   01 00253
000237 024146 A     254          LDB     LSW1                                                    01 00254
000240 174140 A     255          DIV     DIVIS   GET TRIAL QUOTIENT                              01 00255
000241 005001 A     256          TZA                                                             01 00256
000242 001020 A     257          JBZ     DVDZRO  QUOTIENT IS ZERO                                01 00257
000243 000344 R
                    258          FST     RESUL1  SAVE TRIAL QUOTIENT                             01 00258
000244 054136 A
000245 064136 A
000246 164132 A     259          MUL     DIVIS   TEST TRIAL QUOTIENT                             01 00259
000247 064126 A     260          STB     TEMP    SAVE LSW                                        01 00260
000250 024131 A     261          LDB     DIVIS+1                                                 01 00261
000251 164132 A     262          MUL     RESUL1+1                                                01 00262
000252 124123 A     263          ADD     TEMP                                                    01 00263
                    264          FST     TEMP                                                    01 00264
000253 054122 A
000254 064122 A
                    265          FLD     LSW1    TRIAL SUBTRACT                                  01 00265
000255 014130 A
000256 024130 A
000257 002000 A     266          CALL    $6L                                                     01 00266
000260 000000 E
000261 000376 R     267          DATA    TEMP                                                    01 00267
000262 001002 A     268          JAP     DVD020  GOOD QUOTIENT, GO SAVE                          01 00268
000263 000272 R
000264 034117 A     269          LDX     RESUL1+1        SET PROPER QUOTIENT                     01 00269
000265 005344 A     270          DXR                                                             01 00270
000266 074115 A     271          STX     RESUL1+1                                                01 00271
000267 002000 A     272          CALL    $6K     SET REMAINDER                                   01 00272
000270 000000 E
000271 000401 R     273          DATA    DIVIS                                                   01 00273
                    274 DVD020   FST     LSW1    SAVE REMAINDER                                  01 00274
000272 054113 A
000273 064113 A
                    275 *                                D**********************************   01 00275
                    276 *                                * $6N  CALLED?                  *   01 00276
                    277 *                                **********************************   01 00277
000274 034103 A     278 DVD030   LDX     DVDREM  RETURN REMAINDER?                               01 00278
000275 001046 A     279          JXNZ    DVDRET  YES, GO RETURN REMAINDER                        01 00279
000276 000323 R
                    280          FLD     RESUL1  NO, RETURN QUOTIENT                             01 00280
000277 014103 A
000300 024103 A
                    281 *                                P**********************************   01 00281
                    282 *                                * COMPLEMENT QUOTIENT IF        *   01 00282
                    283 *                                * NECESSARY                     *   01 00283
                    284 *                                **********************************   01 00284
000301 034106 A     285          LDX     SIGN    COMPLEMENT QUOTIENT?                            01 00285
000302 005344 A     286          DXR                                                             01 00286
000303 002040 A     287          JXZM    COMP    YES, GO COMPLEMENT                              01 00287
000304 000107 R
000305 034106 A     288 DVD040   LDX     XSAVE   RESTORE X                                       01 00288
000306 001000 A     289          JMP     0       EXIT                                            01 00289
000307 000000 A
                    290 *                                E**********************************   01 00290
                    291 *                                * $6N  DIVIDE QUOTIENT          *   01 00291
                    292 *                                **********************************   01 00292
000307              293 $6N      BES     0                                                       01 00293
                    294 D66000   FSE                                                             01 00294
000310 002000 A
000311 000177 E
000312 000001 A     295          DATA    1                                                       01 00295
000313              296 DVD000   BSS     1                                                       01 00296
000314 074077 A     297          STX     XSAVE   SAVE X                                          01 00297
                    298 *                                P**********************************   01 00298
                    299 *                                * SET $6N  CALLED FLAG          *   01 00299
                    300 *                                **********************************   01 00300
000315 005004 A     301 D66001   TZX             SET RETURN QUOTIENT FLAG                        01 00301
000316 074061 A     302          STX     DVDREM                                                  01 00302
000317 006037 A     303          LDXE    DVD000  SET ADDR OF DIVISOR                             01 00303
000320 000313 R
000321 001000 A     304          JMP     DVD010  GO DIVIDE                                       01 00304
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000322 000212 R
                    306 *                                   P**********************************    01 00306
                    307 *                                   * RETURN REMAINDER              *    01 00307
                    308 *                                   **********************************    01 00308
                    309 DVDRET FLD     LSW1     RETURN REMAINDER                                  01 00309
000323 014062 A
000324 024062 A
000325 001000 A     310        JMP     DVD040   EXIT                                              01 00310
000326 000305 R
                    312 *                                   D**********************************    01 00312
                    313 *                                   * DIVISOR LSW ZERO?             *    01 00313
                    314 *                                   **********************************    01 00314
000327 024052 A     315 DVDINT LDB     DIVIS+1  TEST FOR ZERO DIVISOR                             01 00315
000330 001020 A     316        JBZ     DVDOVF   YES, RETURN OVERFLOW                              01 00316
000331 000350 R
000332 024053 A     317        LDB     LSW1     NO, DO SINGLE PRECISION                           01 00317
000333 174046 A     318        DIV     DIVIS+1                                                    01 00318
000334 064046 A     319        STB     RESUL1   SAVE MSW QUOTIENT                                 01 00319
000335 024051 A     320        LDB     LSW2                                                       01 00320
000336 174043 A     321        DIV     DIVIS+1                                                    01 00321
000337 064044 A     322        STB     RESUL1+1        SAVE LSW QUOTIENT                          01 00322
000340 005012 A     323        TAB                                                                01 00323
000341 005001 A     324        TZA                                                                01 00324
000342 001000 A     325        JMP     DVD020   GO EXIT                                           01 00325
000343 000272 R
                    326 DVDZRO FST     RESUL1                                                     01 00326
000344 054036 A
000345 064036 A
000346 001000 A     327        JMP     DVD030                                                     01 00327
000347 000274 R
                    328 *                                   P**********************************    01 00328
                    329 *                                   * SET MAXIMUM VALUE IN          *    01 00329
                    330 *                                   * QUOTIENT AND REMAINDER        *    01 00330
                    331 *                                   **********************************    01 00331
000350 024040 A     332 DVDOVF LDB     MASK     RETURN MAXIMUM                                    01 00332
000351 005021 A     333        TBA                                                                01 00333
                    334        FST     RESUL1                                                     01 00334
000352 054030 A
000353 064030 A
000354 007401 A     335        SOF             OVERFLOW ERROR                                     01 00335
000355 001000 A     336        JMP     DVD020   GO EXIT                                           01 00336
000356 000272 R
                    337        EJEC                                                               01 00337
000357 000000 A     338 SINSUB ENTR            CONVERT SP TO DP                                   01 00338
000360 054012 A     339        STA     TSING                                                      01 00339
000361 005041 A     340        TXA                                                                01 00340
000362 005004 A     341        TZX                                                                01 00341
000363 001002 A     342        JAP     SIN010   NO CONVERSION NECESSARY                           01 00342
000364 000370 R
000365 005211 A     343        CPA             CONVERT TO TWO WORD NEGATIVE                       01 00343
000366 005111 A     344        IAR             TWO'S COMPLIMENT                                   01 00344
000367 005304 A     345        DECR    04      SET NEW MSW                                        01 00345
000370 074024 A     346 SIN010 STX     SINGLE   STORE MSW                                         01 00346
000371 054024 A     347        STA     SINGLE+1        STORE LSW                                  01 00347
000372 006010 A     348        LDAI    TSING    RESTORE A                                         01 00348
000373 000373 R
000373              349 TSING  BES     0                                                          01 00349
000374 001000 A     350        JMP*    SINSUB   EXIT                                              01 00350
000375 100357 R
                    351 *      PARAMETERS                                                         01 00351
000376              352 TEMP   BSS     2                                                          01 00352
000400              353 DVDREM BSS     1                                                          01 00353
000401              354 DIVIS  BSS     2                                                          01 00354
000403              355 RESUL1 BSS     2                                                          01 00355
000405              356 VAL    BSS     1                                                          01 00356
000406              357 LSW1   BSS     1                                                          01 00357
000407              358 LSW2   BSS     1                                                          01 00358
000410              359 SIGN   BSS     1                                                          01 00359
000411 077777 A     360 MASK   DATA    077777                                                     01 00360
000412              361 FLAG   BSS     1                                                          01 00361
000413 100000 A     362 B15    DATA    0100000                                                    01 00362
000414              363 XSAVE  BSS     1                                                          01 00363
000415 000000 A     364 SINGLE DATA    0,0      DP INTEGER FROM SP                                01 00364
000416 000000 A
                    365        END                                                                01 00365
ENTRY NAMES
000077 R $2M     000153 R $2N     000131 R $2NX    000066 R $6M
000307 R $6N     000175 R $6NX
EXTERNAL NAMES
000270 E $6K     000260 E $6L     000311 E $SE
SYMBOLS
000077 R $2M     000153 R $2N     000131 R $2NX    000270 E $6K
000260 E $6L     000066 R $6M     000307 R $6N     000175 R $6NX
000311 E $SE     000002 A B       000413 R B15     000122 R CMP010
000126 R CMP020  000107 R COMP    000130 R CSAVE   000310 R D66000
000315 R D66001  000201 R D66X05  000203 R D66X10  000401 R DIVIS
000313 R DVD000  000212 R DVD010  000272 R DVD020  000274 R DVD030
000305 R DVD040  000327 R DVDINT  000350 R DVDOVF  000400 R DVDREM
000323 R DVDRET  000344 R DVDZRO  000412 R FLAG    000406 R LSW1
000407 R LSW2    000103 R M2000   000000 R M2010   000411 R MASK
000072 R MUL000  000011 R MUL010  000046 R MUL040  000076 R MULSOF
000157 R N2000   000135 R N2X000  000403 R RESUL1  000410 R SIGN
000370 R SIN010  000415 R SINGLE  000357 R SINSUB  000376 R TEMP
```

```
000373 R TSING  000405 R VAL    000001 A VORTEX 000001 A X
000414 R XSAVE
  0 ERRORS ASSEMBLY COMPLETE

  165   $2M         42    98
  200   $2N         43   205
  188   $2NX        44   193
    0   $6K         55   272
    0   $6L         56   266
  158   $6M         45    99
  293   $6N         46   206   221
  215   $6NX        47   194   220
    0   $SE         65    66
  182   CMP010     175
  185   CMP020     182
  173   COMP       112   120   152   181   185   240   243   287
  301   D66001     211
  218   D66X05     196   227
  220   D66X10     199
    0   DIMULD       8
  354   DIVIS      121   129   133   144   241   245   255   259   261
                   273   315   318   321
  296   DVD000     208   303
  230   DVD010     304
  274   DVD020     268   325   336
  278   DVD030     327
  288   DVD040     310
  315   DVDINT     249
  332   DVDOVF     316
  353   DVDREM     226   278   302
  309   DVDRET     279
  326   DVDZRO     257
  361   FLAG       141   145
   68   FRMWR1      64    76    89
   70   FRMWR2      67    79    92
  357   LSW1       135   148   230   242   244   254   265   274   309
                   317
  358   LSW2       127   320
  168   M2000      102
   98   M2010      170
  360   MASK       139   332
  161   MUL000     101   114
  107   MUL010     163
  141   MUL040     138
  164   MULSOF     147
  203   N2000      209
  191   N2X000     197
    0   P           77    78    82    90    91    95
  355   RESUL1     258   262   269   271   280   319   322   326   334
  359   SIGN       108   150   174   233   285
  346   SIN010     342
  364   SINGLE     100   195   207   346   347
  338   SINSUB     103   198   210   350
  352   TEMP       113   126   128   132   143   260   263   264   267
  349   TSING      339   348
  356   VAL        130   134
    1   VORTEX      62    63    74    75    87    88
   49   X          234   235
  363   XSAVE      153   162   169   192   204   219   288   297
```

```
000001 A     1 VORTEX SET     1                                                                00 00001
             2 *       V.D.M. PART NO.                                                        00 00002
             3 *                                                                              00 00003
             4 *                                  RELEASED                                    00 00004
             5 *                                                                              00 00005
             6 *                 DIADDSUB                                                     00 00006
             7 *                                                                              00 00007
             8         TITLE   DIADDSUB                                                       00 00008
             9 ************************************************************************      00 00009
            10 *                                                                              00 00010
            11 *       DOUBLE PRECISION ADD/SUBTRACT ($6K ,$6L )                              00 00011
            12 *                                                                              00 00012
            13 * FUNCTION: TO ADD OR SUBTRACT TWO DOUBLE WORD INTEGERS                        00 00013
            14 *                                                                              00 00014
            15 * ENTRY: $6K   FOR ADD                                                        00 00015
            16 *         $6L   FOR SUBTRACT                                                   00 00016
            17 *         AB=OPERAND 1                                                         00 00017
            18 *                                                                              00 00018
            19 * CALLING SEQ: JMPM  $6K (OR $6L )                                           00 00019
            20 *                 DATA  ADDRESS OF OPERAND 2                                   00 00020
            21 *                                                                              00 00021
            22 * EXIT: AB=RESULT(OP1+OP2 OR OP1-OP2)                                         00 00022
            23 *       OVFL RESET IF OPERATION OK                                           00 00023
            24 *                                                                              00 00024
            25 * ERRORS: OVERFLOW: OVFL SET, AB=RESULT OF OPERATION                          00 00025
            26 *                                                                              00 00026
            27 ************************************************************************      00 00027
            28         EJEC                                                                  00 00028
            29 **********                                                                    00 00029
            30 * ENTRIES *                                                                   00 00030
            31 **********                                                                    00 00031
            32         NAME    $2K       DP INTEGER PLUS SP INTEGER ENTRY                    00 00032
            33         NAME    $2L       DP INTEGER MINUS SP INTEGER ENTRY                   00 00033
            34         NAME    $6K       DP INTEGER ADD ENTRY                                00 00034
            35         NAME    $6L       DP INTEGER SUBTRACT ENTRY                           00 00035
000001 A    37 X       SET     1         X-REGISTER                                          00 00037
000002 A    38 B       SET     2         B-REGISTER                                          00 00038
            40 **********                                                                    00 00040
            41 * MACROS *                                                                    00 00041
            42 **********                                                                    00 00042
            43 FSE     MAC                                                                   00 00043
            44         IFT     VORTEX-2                                                      00 00044
            45         IFF     VORTEX-4                                                      00 00045
            46         GOTO    FRMWR1                                                        00 00046
            47         EXT     $SE                                                           00 00047
            48         CALL    $SE       XFER PARAMETERS                                     00 00048
            49         GOTO    FRMWR2                                                        00 00049
            50 FRMWR1  CONT                                                                  00 00050
            51         DATA    0105036 BCS XFER PARAMETERS                                   00 00051
            52 FRMWR2  CONT                                                                  00 00052
            53         EMAC                                                                  00 00053
            54         EJEC                                                                  00 00054
000000 074137 A     55 S22010  STX     TEMP3     SAVE X                                      00 00055
000001 034036 A     56         LDX     $2L       SET PROPER RETURN                           00 00056
000002 074025 A     57         STX     $6L                                                   00 00057
000003 006037 A     58         LDXE*   S22000   LOAD INTEGER VALUE                          00 00058
000004 100044 R
000005 002000 A     59         CALL    SINGLS    PREPARE VALUES                              00 00059
000006 000115 R
000007 001000 A     60         JMP     S66020    GO SUBTRACT                                 00 00060
000010 000012 R
            61 *                                          P*********************************  00 00061
            62 *                                          * SUBTRACT OP2 LSW FROM       *    00 00062
            63 *                                          * OP1 MSW                     *    00 00063
            64 *                                          *********************************  00 00064
000011 034022 A     65 S66010  LDX     S66000    GET OP2 ADDR                                00 00065
000012 054123 A     66 S66020  STA     TEMP1     DO LSW'S FIRST                              00 00066
000013 005021 A     67         TBA                                                           00 00067
000014 114125 A     68         ORA     B15       ALLOW POSSIBLE OVERFLOW                     00 00068
            69 *                                          P*********************************  00 00069
            70 *                                          * USE OVERFLOW FOR POSSIBLE   *    00 00070
            71 *                                          * CARRY                       *    00 00071
            72 *                                          *********************************  00 00072
            73                                                                               00 00073
            74 ***************                                                               00 00074
000015 007400 A     75         ROF                                                           00 00075
000016 145001 A     76         SUB     1,X                                                   00 00076
000017 154121 A     77         ANA     MASK      CLEAR SIGN                                  00 00077
000020 005012 A     78         TAB                                                           00 00078
000021 005001 A     79         TZA               NOW DO MSW'S                                00 00079
000022 005711 A     80         SOFA              SUBTRACT CARRY                              00 00080
000023 007400 A     81         ROF               ALLOW FOR TRUE OVERFLOW                     00 00081
            82 *                                          P*********************************  00 00082
            83 *                                          * SUBTRACT OP2 MSW AND        *    00 00083
            84 *                                          * CARRY FROM OP1 MSW          *    00 00084
            85 *                                          *********************************  00 00085
000024 124111 A     86         ADD     TEMP1                                                 00 00086
000025 145000 A     87         SUB     0,X                                                   00 00087
000026 034111 A     88         LDX     TEMP3     RESTORE X REGISTER                          00 00088
            89 *                                          E*********************************  00 00089
            90 *                                          * EXIT                        *    00 00090
            91 *                                          *********************************  00 00091
000027 001000 A     92         JMP     0         RETURN TO CALLER                            00 00092
```

```
000030 000000 A                                                                                    00 00093
                    93 *                                E**********************************      00 00093
                    94 *                                * $6L  SUBTRACT ENTRY          *      00 00094
                    95 *                                **********************************      00 00095
000030              96 $6L      BES     0                                                         00 00096
                    97          FSE             FETCH DP2 ADDRESS                                 00 00097
000031 002000 A
000032 000000 E
000033 000001 A     98          DATA    1                                                         00 00098
000034              99 S66000   BSS     1                                                         00 00099
000035 074102 A    100          STX     TEMP3   SAVE X                                            00 00100
000036 001000 A    101          JMP     S66010  GO SUBTRACT                                      00 00101
000037 000011 R
000040 000000 A    102 $2L      ENTR            DOUBLE MINUS SINGLE                               00 00102
                   103          FSE                                                               00 00103
000041 002000 A
000042 000032 E
000043 000001 A    104          DATA    1                                                         00 00104
000044             105 S22000   BSS     1                                                         00 00105
000045 001000 A    106          JMP   . S22010  GO SUBTRACT                                      00 00106
000046 000000 R
                   107          EJEC                                                              00 00107
000047 074070 A    108 A22010   STX     TEMP3   SAVE X                                            00 00108
000050 034035 A    109          LDX     $2K     SET PROPER RETURN                                 00 00109
000051 074024 A    110          STX     $6K                                                       00 00110
000052 006037 A    111          LDXE*   A22000  LOAD INTEGER VALUE                               00 00111
000053 100112 R
000054 002000 A    112          CALL    SINGLS  PREPARE VALUES                                    00 00112
000055 000115 R
000056 001000 A    113          JMP     A66020  GO ADD                                           00 00113
000057 000061 R
                   114 *                                P**********************************      00 00114
                   115 *                                * ADD LEAST SIGNIFICANT WORDS *      00 00115
                   116 *                                **********************************      00 00116
000060 034021 A    117 A66010   LDX     A66000  GET DP2 ADDR                                     00 00117
000061 054054 A    118 A66020   STA     TEMP1   DO LSW'S FIRST                                    00 00118
000062 005021 A    119          TBA                                                               00 00119
000063 007400 A    120          ROF             PREPARE FOR CARRY                                 00 00120
000064 125001 A    121          ADD     1,X                                                       00 00121
000065 154053 A    122          ANA     MASK    CLEAR SIGN BIT                                    00 00122
000066 005012 A    123          TAB                                                               00 00123
000067 005001 A    124          TZA             ADD IN CARRY                                      00 00124
000070 005511 A    125          ADFA                                                              00 00125
000071 007400 A    126          ROF             ENSURE TRUE OVERFLOW TEST                         00 00126
                   127 *                                P**********************************      00 00127
                   128 *                                * ADD MOST SIGNIFICANT WORDS  *      00 00128
                   129 *                                * AND CARRY                    *      00 00129
                   130 *                                **********************************      00 00130
000072 124043 A    131          ADD     TEMP1   NOW DO MSW'S                                      00 00131
000073 125000 A    132          ADD     0,X                                                       00 00132
000074 034043 A    133          LDX     TEMP3   RESTORE X REGISTER                                00 00133
                   134 *                                E**********************************      00 00134
                   135 *                                * EXIT                         *      00 00135
                   136 *                                **********************************      00 00136
000075 001000 A    137          JMP     0       RETURN TO CALLER                                  00 00137
000076 000000 A
                   138 *                                E**********************************      00 00138
                   139 *                                * $6K  ADD ENTRY               *      00 00139
                   140 *                                **********************************      00 00140
000076             141 $6K      BES     0                                                         00 00141
                   142          FSE             FETCH DP2 ADDRESS                                 00 00142
000077 002000 A
000100 000042 E
000101 000001 A    143          DATA    1                                                         00 00143
000102             144 A66000   BSS     1                                                         00 00144
000103 074034 A    145          STX     TEMP3   SAVE X                                            00 00145
000104 001000 A    146          JMP     A66010  GO ADD                                           00 00146
000105 000060 R
000106 000000 A    147 $2K      ENTR            DOUBLE PLUS SINGLE                                00 00147
                   148          FSE                                                               00 00148
000107 002000 A
000110 000100 E
000111 000001 A    149          DATA    1                                                         00 00149
000112             150 A22000   BSS     1                                                         00 00150
000113 001000 A    151          JMP     A22010  GO ADD                                           00 00151
000114 000047 R
                   152          EJEC                                                              00 00152
000115 000000 A    153 SINGLS   ENTR            CONVERT SINGLE TO DOUBLE                          00 00153
000116 054012 A    154          STA     TSING                                                     00 00154
000117 005041 A    155          TXA             SET LSW                                           00 00155
000120 005004 A    156          TZX             SET MSW                                           00 00156
000121 001002 A    157          JAP     SIN010  NO CONVERSION NECESSARY                           00 00157
000122 000126 R
000123 005211 A    158          CPA             CONVERT TO TWO WORD NEGATIVE                      00 00158
000124 005111 A    159          IAR             TWO'S COMPLIMENT                                  00 00159
000125 005304 A    160          DECR    04      SET NEW MSW                                       00 00160
000126 074014 A    161 SIN010   STX     SINGLE  STORE MSW                                         00 00161
000127 054014 A    162          STA     SINGLE+1        STORE LSW                                 00 00162
000130 006010 A    163          LDAI    TSING   RESTORE A                                         00 00163
000131 000131 R
000131             164 TSING    BES     0                                                         00 00164
000132 006030 A    165          LDXI    SINGLE  SET ADDRESS OF NEW DP INTEGER                     00 00165
000133 000143 R
```

```
000134 001000 A  166          JMP*     SINGLS  EXIT                          00 00166
000135 100115 R
000136           167 TEMP1    BSS      1                                      00 00167
000137           168 TEMP2    BSS      1                                      00 00168
000140           169 TEMP3    BSS      1                                      00 00169
000141 077777 A  170 MASK     DATA     077777                                 00 00170
000142 100000 A  171 B15      DATA     0100000                                00 00171
000143 000000 A  172 SINGLE   DATA     0,0      NEW DP INTEGER                00 00172
000144 000000 A
                 173          END                                             00 00173
ENTRY NAMES
000106 R $2K     000040 R $2L     000076 R $6K     000030 R $6L
EXTERNAL NAMES
000110 E $SE
SYMBOLS
000106 R $2K     000040 R $2L     000076 R $6K     000030 R $6L
000110 E $SE     000112 R A22000  000047 R A22010  000102 R A66000
000060 R A66010  000061 R A66020  000002 A B       000142 R B15
000141 R MASK    000044 R S22000  000000 R S22010  000034 R S66000
000011 R S66010  000012 R S66020  000126 R SIN010  000143 R SINGLE
000115 R SINGLS  000136 R TEMP1   000137 R TEMP2   000140 R TEMP3
000131 R TSING   000001 A VORTEX  000001 A X
  0 ERRORS ASSEMBLY COMPLETE
```

147	$2K	32	109				
102	$2L	33	56				
141	$6K	34	110				
96	$6L	35	57				
0	$SE	47	48				
150	A22000	111					
108	A22010	151					
144	A66000	117					
117	A66010	146					
118	A66020	113					
171	B15	68					
0	DIADDS	8					
50	FRMWR1	46					
52	FRMWR2	49					
170	MASK	77	122				
105	S22000	58					
55	S22010	106					
99	S66000	65					
65	S66010	101					
66	S66020	60					
161	SIN010	157					
172	SINGLE	161	162	165			
153	SINGLS	59	112	166			
167	TEMP1	66	86	118	131		
169	TEMP3	55	88	100	108	133	145
164	TSING	154	163				
1	VORTEX	44	45				
37	X	76	87	121	132		

```
000001 A     1 VORTEX SET     1                PUT LAST FOR VORTEX                    V2  03 00001
             2 *THIS IS A COPYRIGHTED PROGRAM.COPYRIGHT 1973 BY VARIAN DATA MACHINEV2  03 00002
             3 *                                                                        03 00003
             4 *    V.D.M.  PART  NO.        92L1406-001B                              03 00004
             5 *                                                                        03 00005
             6 *                                          RELEASED    03/01/74      03 00006
             7 *                                                                        03 00007
             8 *               MICSIM                                                   03 00008
             9 *                                                                        03 00009
            10 ************************************************************************ 03 00010
            11 *                                                                        03 00011
            12 *       THE FOLLOWING ARE THE MICRO REDEFINITIONS NECESSARY TO RUN       03 00012
            13 *       THIS PROGRAM USING THE INTERFACE SUBPROGRAM                      03 00013
            14 *            THEIR EFFECT IS TO CHANGE VORTEX CALLS TO V$IOC, V$IOST,    03 00014
            15 *            AND V$EXEC TO CALLS TO THE INTERFACE SUBPROGRAM             03 00015
            16         TITLE   MICSIM                                                  03 00016
            17 M1      MAC                                                             03 00017
            18         EXT     INTR                                                   $03 00018
            19         JMPM    INTR                                                   $03 00019
            20         DATA    0100000                                                $03 00020
            21 F       FORM    1,3,4,8                                                $03 00021
            22         F       P(1),P(2),P(3),P(4)                                    $03 00022
            23         DATA    P(5),0,0                                               $03 00023
            24         EMAC                                                           $03 00024
            25 STAT    MAC                                                            $03 00025
            26         EXT     INTRST                                                 $03 00026
            27         JMPM    INTRST                                                 $03 00027
            28         DATA    P(1),P(2),P(3),P(4),P(5)                               $03 00028
            29         EMAC                                                           $03 00029
            30 IOLINK  MAC                                                            $03 00030
            31         EXT     INLINK                                                 $03 00031
            32         JMPM    INLINK                                                 $03 00032
            33 F       FORM    4,6,6                                                  $03 00033
            34         F       0,014,P(1)                                             $03 00034
            35         DATA    P(2),P(3)                                              $03 00035
            36         EMAC                                                           $03 00036
            37         EJEC                                                           $03 00037
            38         NAME    SMLTR                                                  $03 00038
            39 *       THIS IS SOME INITIALIZATION NEEDED AFTER LOADING IN ORDER TO  * $03 00039
            40 *       SET UP FCBS AND DCBS FOR THE LOGICAL UNITS ST,PI,LO,AND BI    * $03 00040
            41 *       DEPENDING UPON WHETHER THEY ARE ON A RMD OR NON-RMD DEVICE.   * $03 00041
            42 *                                                                     * $03 00042
            43 *            IF ON A RMD THE GLOBAL FCB WILL BE USED                  * $03 00043
            44 *            IF ON A NON-RMD A LOCAL DCB WILL BE USED                 * $03 00044
            45 *                                                                     * $03 00045
            47         NAME    MMEM,EMEM                                           F  ********
000000      48 MMEM    BSS     0200            MAIN MEMORY BLOCK                   F  ********
000177      49 EMEM    BES     0               END OF MAIN MEMORY                  F  ********
000200 120240 A  50 BUFR    DATA    0120240         GENERAL USAGE BUFFER            F  ********
            51 *                                                                   F  ********
            52 * NOTE--THIS SECTION WILL BE OVERLAYED BY THE BUFFER BUFR           F  ********
            53 *                                                                   F  ********
000201 002000 A  54 SMLTR   CALL    RMD,2           CHECK IF SI IS ON A RMD            $03 00047
000202 011467 R
000203 000002 A
000204 001010 A  55         JAZ     SIRMD           YES                                $03 00048
000205 000227 R
000206 002000 A  56 SMPI    CALL    RMD,4           CHECK IF PI IS ON A RMD            $03 00049
000207 011467 R
000210 000004 A
000211 001010 A  57         JAZ     PIRMD           YES                                $03 00050
000212 000236 R
000213 002000 A  58 SMLO    CALL    RMD,5           CHECK IF LO IS ON A RMD            $03 00051
000214 011467 R
000215 000005 A
000216 001010 A  59         JAZ     LORMD           YES                                $03 00052
000217 000261 R
000220 002000 A  60 SMBI    CALL    RMD,6           CHECK IF BI IS ON A RMD            $03 00053
000221 011467 R
000222 000006 A
000223 001010 A  61         JAZ     BIRMD           YES                                $03 00054
000224 000304 R
000225 001000 A  62         JMP     EXC             BEGIN SIMULATOR EXEC               $03 00055
000226 000716 R
            63         EXT     SIFCB                                              $03 00056
            64         EXT     PIFCB                                              $03 00057
            65         EXT     LOFCB                                              $03 00058
            66         EXT     BIFCB                                              $03 00059
            67 *                                                                  $03 00060
000227 014102 A  68 SIRMD   LDA     FCBSI                                          $03 00061
000230 057000 I  69         STA     SIIN1+4         STORE GLOBAL FCB IN READ REQUEST   $03 00062
000231 005301 A  70         DECR    01                                             $03 00063
000232 006057 A  71         STAE    SIFLG           SET SI ON RMD FLAG                 $03 00064
000233 015316 R
000234 001000 A  72         JMP     SMPI                                           $03 00065
000235 000206 R
000236 034074 A  73 PIRMD   LDX     FCBPI                                          $03 00066
000237 015003 A  74         LDA     3,1             CURRENT POSITION OF FILE         D.103 00067
000240 005311 A  75         DAR                                                    $03 00068
000241 001002 A  76         JAP     PIOPN+7         JUMP IF ALREADY OPEN               $03 00069
000242 000252 R
            77 PIOPN   OPEN    PIFCB,4,0,0     OPEN AND REWIND PIFCB              $03 00070
000243 002000 A
```

```
000244 000000 E
000245 100000 A
000246 003004 A
000247 000000 E
000250 000000 A
000251 000000 A
000252 014060 A    78          LDA     FCBPI
000253 057000 I    79          STA     PIIN2+4          STORE GLOBAL FCB IN READ REQUEST
000254 005301 A    80          DECR    01
000255 006057 A    81          STAE    PIFLG            SET PI ON RMD FLAG
000256 015402 R
000257 001000 A    82          JMP     SMLO
000260 000213 R
000261 034052 A    83 LORMB    LDX     FCBLO
000262 015003 A    84          LDA     3,1              CURRENT POSITION OF FILE
000263 005311 A    85          DAR
000264 001002 A.   86          JAP     LOOPN+7          JUMP IF ALREADY OPEN
000265 000275 R
                   87 LOOPN    OPEN    LOFCB,5,0,0      OPEN AND REWIND LOFCB
000266 002000 A
000267 000244 E
000270 100000 A
000271 003005 A
000272 000000 E
000273 000000 A
000274 000000 A
000275 014036 A    88          LDA     FCBLO
000276 057000 I    89          STA     LO1+4            STORE GLOBAL FCB IN READ REQUEST
000277 005301 A    90          DECR    01
000300 006057 A    91          STAE    LOFLG            SET LO ON RMD FLAG
000301 015603 R
000302 001000 A    92          JMP     SMBI
000303 000220 R
000304 034030 A    93 BIRMD    LDX     FCBBI
000305 015003 A    94          LDA     3,1              CURRENT POSITION OF FILE
000306 005311 A    95          DAR
000307 001002 A    96          JAP     BIOPN+7          JUMP IF ALREADY OPEN
000310 000320 R
                   97 BIOPN    OPEN    BIFCB,6,0,0      OPEN AND REWIND
000311 002000 A
000312 000267 E
000313 100000 A
000314 003006 A
000315 000000 E
000316 000000 A
000317 000000 A
000320 014014 A    98          LDA     FCBBI
000321 057000 I    99          STA     LREAD+4          STORE GLOBAL FCB IN READ REQUEST
000322 006010 A   100          LDAI    120
000323 000170 A
000324 057000 I   101          STA     BIBLK+1          SET WORD COUNT TO 120
000325 005301 A   102          DECR    01
000326 006057 A   103          STAE    BIFLG            SET BI ON RMD FLAG
000327 011531 R
000330 001000 A   104          JMP     EXC              BEGIN STMULATOR EXEC
000331 000716 R
000332 000000 E   105 FCBSI    DATA    SIFCB
000333 000247 E   106 FCBPI    DATA    PIFCB
000334 000272 E   107 FCBLO    DATA    LOFCB
000335 000315 E   108 FCBBI    DATA    BIFCB
000336            109          BSS     121+BUFR-*       FILL OUT TO MAKE 120 WORD BUFR SPACE    F  ********
                  111 **********************************************************************
                  112          EJEC
                  113          EXT     EXIT
000001 A          114 X        EQU     1
000002 A          115 B        EQU     2
000002 A          116 SI       EQU     2                SYSTEM INPUT
000003 A          117 SO       EQU     3                SYSTEM OUTPUT
000004 A          118 PI       EQU     4                PROCESSOR INPUT
000005 A          119 LO       EQU     5                LIST OUTPUT
000010 A          120 AZ       EQU     010              A ZERO
000020 A          121 BZ       EQU     020              B ZERO
000040 A          122 XZ       EQU     040              X ZERO
                  123 *
                  124 *        ROM CONTROL BUFFER
                  125 *
                  126          EXT     $DBUF            CONTROL STORE PAGE 0                    F  ********
000371 000000 E   127 DBUF     DATA    $DBUF
                  128 *
                  129 *    THE FOLLOWING TWO TABLES ARE FOR THE
                  130 *    DECODE ROM'S.
                  131 *
                  132          EXT     $DRM1            DECODER STORE PAGE 0 DECODE 1           F  ********
                  133          EXT     $DRM2            DECODER STORE PAGE 0 DECODE 2           F  ********
                  134          EXT     $DRM1B,$DRM1C,$DRM1D                                     F  ********
000372 000000 E   135 DRM1     DATA    $DRM1
000373 000000 E   136 DRM2     DATA    $DRM2
                  137 *
                  138 *
                  139 *        PRINT OUTPUT BUFFER
000374 120240 A   140          DATA    0120240
000375            141 BUFI     BSS     36               INPUT BUFFER
                  142 *
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000441 000445 R  143 RHLT  DATA  RHLT0          HALT TABLE FOR PAGE 0                    C 03 00137
000442 000452 R  144       DATA  RHLT1          HALT TABLE FOR PAGE 1                    C 03 00138
000443 000457 R  145       DATA  RHLT2          HALT TABLE FOR PAGE 2                    C 03 00139
000444 000464 R  146       DATA  RHLT3          HALT TABLE FOR PAGE 3                    C 03 00140
000445 001000 A  147 RHLT0 DATA  512,512,512,512,512                                     C 03 00141
000446 001000 A
000447 001000 A
000450 001000 A
000451 001000 A
000452 001000 A  148 RHLT1 DATA  512,512,512,512,512                                     C 03 00142
000453 001000 A
000454 001000 A
000455 001000 A
000456 001000 A
000457 001000 A  149 RHLT2 DATA  512,512,512,512,512                                     C 03 00143
000460 001000 A
000461 001000 A
000462 001000 A
000463 001000 A
000464 001000 A  150 RHLT3 DATA  512,512,512,512,512                                     C 03 00144
000465 001000 A
000466 001000 A
000467 001000 A
000470 001000 A
000471 000000 A  151 STEP  DATA  0              SINGLE STEP FLAG                         $03 00145
000472 000000 A  152 TRACE DATA  0,0,0,0        TRACE FLAGS                          D   03 00146
000473 000000 A
000474 000000 A
000475 000000 A
                 153 *                                                                   $03 00147
                 154 *     INPUT HEX DIGIT STRING                                        $03 00148
000476 000000 A  155 V     DATA  0              DIGITS 1-4                               $03 00149
000477 000000 A  156       DATA  0              DIGITS 5-8                               $03 00150
000500 000000 A  157       DATA  0              DIGITS 9-12                              $03 00151
000501 000000 A  158       DATA  0              DIGITS 13-16                             $03 00152
                 159 *                                                                   $03 00153
                 160 *                                                                   $03 00154
                 161 *                         EACH CONTROL ROM WORD(DBUF) EXECUTED      $03 00156
                 162 *                                                                   $03 00157
                 163 *                                                                   $03 00158
000502 000000 A  164 JSPT  DATA  0                                                       $03 00159
000503 000000 A  165 CPAG  DATA  0                                                       $03 00160
000504 000000 A  166 PPAG  DATA  0                                                   E.2 ********
000505 000000 A  167 IMD   DATA  0                                                       $03 00161
000506           168 STACK BSS   16             PUSH-POP STACK                           $03 00162
                 169 *                                                                   $03 00163
                 170 *     MICRO DATA PSEUDO REGISTERS                                   $03 00164
                 171 *                                                                   $03 00165
000526 000000 A  172 R0    DATA  0                                                       $03 00166
000527 000000 A  173 R1    DATA  0                                                       $03 00167
000530 000000 A  174 R2    DATA  0                                                       $03 00168
000531 000000 A  175 R3    DATA  0                                                       $03 00169
000532 000000 A  176 R4    DATA  0                                                       $03 00170
000533 000000 A  177 R5    DATA  0                                                       $03 00171
000534 000000 A  178 R6    DATA  0                                                       $03 00172
000535 000000 A  179 R7    DATA  0                                                       $03 00173
000536 000000 A  180 R8    DATA  0                                                       $03 00174
000537 000000 A  181 R9    DATA  0                                                       $03 00175
000540 000000 A  182 RA    DATA  0                                                       $03 00176
000541 000000 A  183 RB    DATA  0                                                       $03 00177
000542 000000 A  184 RC    DATA  0                                                       $03 00178
000543 000000 A  185 RD    DATA  0                                                       $03 00179
000544 000000 A  186 RE    DATA  0                                                       $03 00180
000545 000000 A  187 RF    DATA  0                                                       $03 00181
                 188       EJEC                                                        $03 00182
                 189 *                                                                   $03 00183
                 190 *     OUTPUT SIGNALS FROM DATA ROM BUFFER                           $03 00184
                 191 *                                                                   $03 00185
000546 000000 A  192 DROM  DATA  0        TS    4 BITS/TEST ADDR&OFFSET                 $03 00186
000547 000000 A  193       DATA  0        AF    5 BITS/CONTROL STORE ADDR               $03 00187
000550 000000 A  194       DATA  0        MS    4 BITS/CONTROL ADDR MASK                $03 00188
000551 000000 A  195       DATA  0        MT    1 BITS/                                 $03 00189
000552 000000 A  196       DATA  0        FS    4 BITS/CONTROL FIELD SELECT GATING      $03 00190
000553 000000 A  197       DATA  0        T     2 BITS/TEST CONTROL                     $03 00191
000554 000000 A  198       DATA  0        S     2 BITS/SPECIAL CONTROL                  $03 00192
000555 000000 A  199       DATA  0        G     4 BITS/GENERAL CONTROL                  $03 00193
000556 000000 A  200       DATA  0        M     1 BITS/FILE ADDR FIELD EXTR MASK        $03 00194
000557 000000 A  201       DATA  0        AB    2 BITS/FILE ADDR LOAD CONTROL           $03 00195
000560 000000 A  202       DATA  0        IMC   4 BITS/I/O AND MEMORY CONTROL           $03 00196
000561 000000 A  203       DATA  0        LB    2 BITS/FILE B CONTROL                   $03 00197
000562 000000 A  204       DATA  0        LA    2 BITS/FILE A CONTROL                   $03 00198
000563 000000 A  205       DATA  0        R     3 BITS/REGISTER CONTROL                 $03 00199
000564 000000 A  206       DATA  0        F     4 BITS/FUNCTION                         $03 00200
000565 000000 A  207       DATA  0        MD    1 BITS/ARITHMETIC-LOGICAL               $03 00201
000566 000000 A  208       DATA  0        C     2 BITS/CARRY CONTROL                    $03 00202
000567 000000 A  209       DATA  0        W     1 BITS/WRITE FILE CONTROL               $03 00203
000570 000000 A  210       DATA  0        DS    1 BIT/DP REG SHIFT/NO-SHIFT CONTROL     $03 00204
000571 000000 A  211       DATA  0        V     1 BIT/DP REG GATING CONTROL             $03 00205
000572 000000 A  212       DATA  0        Y     1 BIT/CONTROL FOR QS(MUL/DIV OPS)       $03 00206
000573 000000 A  213       DATA  0        X     2 BITS/DP REG LONG-SHIFTING CONTROL     $03 00207
000574 000000 A  214       DATA  0        TC    3 BITS/OVERFLOW CONTROL                 $03 00208
000575 000000 A  215       DATA  0        B     4 BITS/FILE B SOURCE ADDR SELECT/B-MUX  $03 00209
                 216 *                           SELECT INPUT TO LATCH B               $03 00210
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000576 000000 A  217          DATA    0        A     4 BITS/FILE A SOURCE/FILE A,B DESTINATION  S03 00211
                 218 *                                                                           S03 00212
                 219 *    THE FOLLOWING ARE OTHER REGISTERS IN THE V73                           S03 00213
                 220 *                                                                           S03 00214
000577 000000 A  221          DATA    0              MASK/16-BIT:FIELDS MD,C,W,OS,V,Y,X,TC,B     S03 00215
000600 000000 A  222          DATA    0              LATCH A                                     S03 00216
000601 000000 A  223          DATA    0              LATCH B                                     S03 00217
000602 000000 A  224          DATA    0              ALU OUTPUT                                  S03 00218
000603 000000 A  225          DATA    0              XCIN - CARRY IN                             S03 00219
000604 000000 A  226          DATA    0              STORED CARRY - CARRY                        S03 00220
000605 000000 A  227          DATA    0              OVERFLOW - OVRFL                            S03 00221
000606 000000 A  228          DATA    0              IOD---I/O DATA REGISTER                     S03 00222
000607 000000 A  229          DATA    0              STUS--STATUS REGISTER                       S03 00223
                 230 *    THE NEXT SEVEN MUST STAY  IN THIS SEQ.FOR PROPER INDEX CONTROL        S03 00224
000610 000000 A  231          DATA    0              PROGRAM COUNTER                             S03 00225
000611 000000 A  232          DATA    0              SHIFT COUNTER                               S03 00226
000612 000000 A  233          DATA    0              OPERAND(O) REGISTER                         S03 00227
000613 000000 A  234          DATA    0              NOT USED- FILLER FOR INDEXING PURPOSES      S03 00228
000614 000000 A  235          DATA    0              NOT USED- FILLER FOR INDEXING PURPOSES      S03 00229
000615 000000 A  236          DATA    0              KEY REGISTER                                S03 00230
000616 000000 A  237          DATA    0              I/O KEY REGISTER                            S03 00231
                 238 *                                                                           S03 00232
000617 000000 A  239          DATA    0              INSTRUCTION REG #1                          S03 00233
000620 000000 A  240          DATA    0              INSTRUCTION REG #2                          S03 00234
000621 000000 A  241          DATA    0              MADS: MEM ADDR SOURCE CODE                  S03 00235
000622 000000 A  242          DATA    0              MOPC: MEM OPERATION CODE                    S03 00236
000623 000000 A  243          DATA    0              MCCO: MEM CONDITION CODE                    S03 00237
000624 000000 A  244          DATA    0              MIL : MEMORY INTERFACE LATCH                S03 00238
000625 000000 A  245          DATA    0              NEXT ROM ADDR                               S03 00239
000626 000000 A  246          DATA    0              BYTE DESIGNATOR FOR MEMORY OPERATIONS       S03 00240
                 247 *                               1=RIGHT BYTE  0=LEFT BYTE            C.1  03 00241
000627 000000 A  248          DATA    0              INTERRUPT PENDING FLAG                      S03 00242
000630 000000 A  249          DATA    0              INTERRUPT ADDR FROM I/O                     S03 00243
000631 000000 A  250          DATA    0              QS: SAVES ALU15/OR01 FOR MUL/DIV OPS        S03 00244
000632 000000 A  251          DATA    0              DS: SIGN STORAGE FOR OREG SHIFTING          S03 00245
000633 000000 A  252          DATA    0              SUPK: SUPERVISOR KEY                        S03 00246
000634 000000 A  253          DATA    0              IORF: I/O REQUEST * NOT SIMULATED *         S03 00247
000635 000000 A  254          DATA    0              INPF-INTERRUPY BEING PROCESSED FLAG         S03 00248
000636 000000 A  255          DATA    0              LREG: MEMORY ADDRESS SELECT REGISTER        S03 00249
000637 000000 A  256          DATA    0              MULS: MULTIPLY SIGN BIT                     S03 00250
000640 000000 A  257          DATA    0              NSTP: STEP F/F (NO LOGIC HERE-IN SETS IT)   S03 00251
                 258 *                                                                           S03 00252
                 259 *                                                                           S03 00253
                 260 *    SEE DATA ITEMS ABOVE FOR NAMES/DESCRIPTIONS                            S03 00254
    000000 A     261 XTS      EQU     0                                                          S03 00255
    000001 A     262 XAF      EQU     1                                                          S03 00256
    000002 A     263 XMS      EQU     2                                                          S03 00257
    000003 A     264 XMT      EQU     3                                                          S03 00258
    000004 A     265 XFS      EQU     4                                                          S03 00259
    000005 A     266 XT       EQU     5                                                          S03 00260
    000006 A     267 XS       EQU     6                                                          S03 00261
    000007 A     268 XG       EQU     7                                                          S03 00262
    000010 A     269 XM       EQU     8                                                          S03 00263
    000011 A     270 XAB      EQU     9                                                          S03 00264
    000012 A     271 XIMC     EQU     10                                                         S03 00265
    000013 A     272 XLB      EQU     11                                                         S03 00266
    000014 A     273 XLA      EQU     12                                                         S03 00267
    000015 A     274 XR       EQU     13                                                         S03 00268
    000016 A     275 XF       EQU     14                                                         S03 00269
    000017 A     276 XMD      EQU     15                                                         S03 00270
    000020 A     277 XC       EQU     16                                                         S03 00271
    000021 A     278 XW       EQU     17                                                         S03 00272
    000022 A     279 XOS      EQU     18                                                         S03 00273
    000023 A     280 XV       EQU     19                                                         S03 00274
    000024 A     281 XY       EQU     20                                                         S03 00275
    000025 A     282 XX       EQU     21                                                         S03 00276
    000026 A     283 XTC      EQU     22                                                         S03 00277
    000027 A     284 XB       EQU     23                                                         S03 00278
    000030 A     285 XA       EQU     24                                                         S03 00279
                 286 *                                                                           S03 00280
    000031 A     287 MASK     EQU     25                                                         S03 00281
                 288 *                                                                           S03 00282
    000032 A     289 LTCHA    EQU     26                                                         S03 00283
    000033 A     290 LTCHB    EQU     27                                                         S03 00284
    000034 A     291 XALU     EQU     28                                                         S03 00285
    000035 A     292 XCIN     EQU     29                                                         S03 00286
    000036 A     293 CARRY    EQU     30                                                         S03 00287
    000037 A     294 OVRFL    EQU     31                                                         S03 00288
                 295 *                                                                           S03 00289
    000040 A     296 IOD      EQU     32                                                         S03 00290
    000041 A     297 STUS     EQU     33                                                         S03 00291
    000042 A     298 PREG     EQU     34                                                         S03 00292
    000043 A     299 SREG     EQU     35                                                         S03 00293
    000044 A     300 OREG     EQU     36                                                         S03 00294
    000045 A     301 FIL1     EQU     37                                                         S03 00295
    000046 A     302 FIL2     EQU     38                                                         S03 00296
    000047 A     303 KREG     EQU     39                                                         S03 00297
    000050 A     304 IOKR     EQU     40                                                         S03 00298
    000051 A     305 IRG1     EQU     41                                                         S03 00299
    000052 A     306 IRG2     EQU     42                                                         S03 00300
                 307 *                                                                           S03 00301
    000053 A     308 MADS     EQU     43                                                         S03 00302
    000054 A     309 MOPC     EQU     44                                                         S03 00303
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000053 A  310 MCCO    EQU     45                                                    $03 00304
000056 A  311 MIL     EQU     46                                                    $03 00305
000057 A  312 NROM    EQU     47          NEXT ROM ADDR                             $03 00306
000060 A  313 MBYC    EQU     48                                                    $03 00307
          314 *                                                                     $03 00308
000061 A  315 INTF    EQU     49          INTERRUPT PENDING FLAG                    $03 00309
000062 A  316 INTA    EQU     50          INTERRUPT ADDR FROM I/O                   $03 00310
000063 A  317 QS      EQU     51          SAVE ALU15/DR01 FOR MUL/DIV OPS.          $03 00311
000064 A  318 DS      EQU     52          SIGN STORAGE FOR DREG SHIFTING            $03 00312
000065 A  319 SUPK    EQU     53          SUPERVISOR KEY                            $03 00313
000066 A  320 IORF    EQU     54          I/O REQUEST ** NOT SIMULATED **           $03 00314
000067 A  321 INPF    EQU     55          INTERRUPT BEING PROCESSED FLAG            $03 00315
000070 A  322 LREG    EQU     56          MEM ADDR SELECT REG.                      $03 00316
000071 A  323 MULS    EQU     57          MULTIPLY SIGN BIT                         $03 00317
000072 A  324 NSTP    EQU     58          STEP F/F. (NO LOGIC HERE-IN SETS IT)      $03 00318
          325 *                                                                     $03 00319
          326 *                                                                     $03 00320
          327 *    TABLE OF TEST CONDITION FLAGS/F/F'S                              $03 00321
          328 *    THE G FIELD SELECTS ONE OF THESE AS THE OUTPUT                   $03 00322
          329 *    FROM THE TEST MUX.                                               $03 00323
          330 *    1=TRUE CONDITION/SSW SET   0=FALSE/RESET CONDITION               $03 00324
          331 *                                                                     $03 00325
          332 *                        TEST CONDITION                               $03 00326
000641 000000 A  333 TMUX    DATA    0  G=0  ALU OVERFLOW                          $03 00327
000642 000000 A  334         DATA    0  G=1   I/O SENSE                           $03 00328
000643 000000 A  335         DATA    0  G=2   SSW3                                $03 00329
000644 000000 A  336         DATA    0  G=3   SSW2                                $03 00330
000645 000000 A  337         DATA    0  G=4   SSW1                                $03 00331
000646 000000 A  338         DATA    0  G=5   620/F TEST(JMP, JMPM, XEC GROUPS)   $03 00332
000647 000000 A  339         DATA    0  G=6   EQUALS F/F                          $03 00333
000650 000000 A  340         DATA    0  G=7   SIGN F/F                           $03 00334
000651 000000 A  341         DATA    0  G=8   CARRY F/F                          $03 00335
000652 000000 A  342         DATA    0  G=9   ZERO                               $03 00336
000653 000000 A  343         DATA    0  G=10  DS  F/F                            $03 00337
000654 000000 A  344         DATA    0  G=11  MIL15--SIGN BIT OF MEMORY LATCH    $03 00338
000655 000000 A  345         DATA    0  G=12  SHIFT COUNT = -1                    $03 00339
000656 000000 A  346         DATA    0  G=13  A15 (SIGN OF A REG)FOR MUL OPERATION$03 00340
000657 000000 A  347         DATA    0  G=14  DAL15 NOT EQUAL TO DAL14(ALU BITS)  $03 00341
000660 000000 A  348         DATA    0  G=15  QS F/F                              $03 00342
          349                EJEC                                                 $03 00343
          350 *                                                                     $03 00344
          351 *    INPUT PROCESSING COMMAND TABLE                                   $03 00345
          352 *                                                                     $03 00346
000661 000301 A  353 COMM    DATA    0301  A  ALTER/DISPLAY ROM REGISTERS         $03 00347
000662 000302 A  354         DATA    0302  B  BEGIN SIMULATED EXECUTION           $03 00348
000663 000303 A  355         DATA    0303  C  CHANGE/DISPLAY MEMORY               $03 00349
000664 000304 A  356         DATA    0304  D  DUMP ROM BUFFER TO LO               $03 00350
000665 000305 A  357         DATA    0305  E  CHANGE/DISPLAY DECODE ROM(S) WORDS  $03 00351
000666 000310 A  358         DATA    0310  H  SET ROM HALT ADDRESS                $03 00352
000667 000311 A  359         DATA    0311  I  INITIALIZE                          $03 00353
000670 000314 A  360         DATA    0314  L  LOAD CONTROL STORE                  $03 00354
000671 000315 A  361         DATA    0315  M  SELECT INPUT MEDIA                  $03 00355
000672 000320 A  362         DATA    0320  P  PAGE SELECT                        $03 00356
000673 000322 A  363         DATA    0322  R  RETURN TO OPERATING SYSTEM          $03 00357
000674 000323 A  364         DATA    0323  S  SINGLE STEP ROM INSTRUCTION        $03 00358
000675 000324 A  365         DATA    0324  T  TRACE                              $03 00359
000676 000332 A  366         DATA    0332  Z  ZERO TABLES                     F  ********
000677 177777 A  367         DATA    -1    END OF COMM BUFFER                     $03 00360
          368 *                                                                     $03 00361
000700 010225 R  369 COMM1   DATA    E100  A  ALTER/DISPLAY ROM REGISTERS         $03 00362
000701 001441 R  370         DATA    S100  B  BEGIN SIMULATED EXECUTION           $03 00363
000702 010607 R  371         DATA    CMEM  C  CHANGE/DISPLAY MEMORY               $03 00364
000703 012215 R  372         DATA    E150  D  DUMP ROM BUFFER                     $03 00365
000704 012530 R  373         DATA    EDRM  E  CHANGE/DISPLAY DECODE ROM(S) WORDS  $03 00366
000705 011757 R  374         DATA    E120  H  SET ROM HALT ADDR                   $03 00367
000706 000716 R  375         DATA    EXC   I  INITIALIZE                          $03 00368
000707 010664 R  376         DATA    LDRM  L  LOAD CONTROL STORE                  $03 00369
000710 012502 R  377         DATA    CHME  M  SELECT INPUT MEDIA                  $03 00370
000711 001163 R  378         DATA    PSEL  P  PAGE SELECT                         $03 00371
000712 012451 R  379         DATA    E170  R  RETURN TO OPERATING SYSTEM          $03 00372
000713 012017 R  380         DATA    E130  S  SINGLE MICRO INST STEP              $03 00373
000714 012061 R  381         DATA    E140  T  TRACE                              $03 00374
000715 001047 R  382         DATA    EXCS  Z  ZERO TABLES                     F  ********
          383                EJEC                                                 $03 00375
          384 *                                                                     $03 00376
          385 *    SIMULATOR EXECUTIVE                                              $03 00377
          386                NAME    EXC                                       F  ********
          387 *                                                                     $03 00378
000716    388 EXC    BSS     0                                                     $03 00379
000716 005001 A  389         TZA                                                   $03 00380
000717 006057 A  390         STAE    PAGE        DEFAULT TO PAGE 0                 $03 00381
000720 001213 R
000721 006057 A  391         STAE    STEP        SET RUN MODE                      $03 00382
000722 000471 R
000723 006057 A  392         STAE    LOLINE      SET LOLINE COUNT                  $03 00383
000724 015613 R
          393 *                                                                     $03 00387
000725 005001 A  394         TZA                                                   $03 00388
000726 002000 A  395         JMPM    SAR         INITIALIZE                    D   03 00389
000727 014702 R
000730 000004 A  396         DATA    4           START                         D   03 00390
000731 012126 R  397         DATA    STRTRC      TRACE                         D   03 00391
000732 006010 A  398         LDAI    0777                                      $03 00392
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000733 000777 A
000734 002000 A  399          JMPM    SAR             INITIALIZE                                    D   03 00393
000735 014702 R
000736 000004 A  400          DATA    4               END                                           D   03 00394
000737 012132 R  401          DATA    ENDTRC          TRACE                                         D   03 00395
000740 024135 A  402          LDB     EXC3            RHLT ADDR                                         $03 00396
000741 006010 A  403          LDAI    512             ADDRESS OF LAST WORD IN PAGE + 1                  $03 00397
000742 001000 A
000743 006030 A  404          LDXI    -20                                                           C 03 00398
000744 177754 A
000745 001040 A  405 EXC0     JXZ     EXC1            IF HALT TABLES DONE                           C 03 00399
000746 000754 R
000747 056000 A  406          STA     0,2                                                           C 03 00400
000750 005122 A  407          IBR                     ADVANCE POINTER                               C 03 00401
000751 005144 A  408          IXR                                                                   C 03 00402
000752 001000 A  409          JMP     EXC0            GO BACK FOR MORE                              C 03 00403
000753 000745 R
000754 024122 A  410 EXC1     LDB     EXC3+1          ADDR OF TRACE FLAG                            C 03 00404
000755 005301 A  411          DECR    01                                                                $03 00405
000756 056000 A  412          STA     0,2             SET TRACE ON                                      $03 00406
000757 056001 A  413          STA     1,2             FOR                                           D   03 00407
000760 056002 A  414          STA     2,2             ALL                                           D   03 00408
000761 056003 A  415          STA     3,2             PAGES                                         D   03 00409
000762 024115 A  416          LDB     EXC3+2                                                        D   03 00410
000763 056000 A  417          STA     0,2             CLEAR RUN COUNT                               D   03 00411
000764 001001 A  418          JOF     *+2             RESET OVERFLOW F/F                                $03 00412
000765 000766 R
000766 024410 A  419          LDB     ELOC                                                              $03 00413
000767 026000 A  420          LDB     0,2                                                               $03 00414
000770 016000 A  421          LDA     0,2             LAST LOADED LOCATION                              $03 00415
000771 005111 A  422          IAR                     FIRST AVAILABLE LOCATION                          $03 00416
000772 054222 A  423          STA     PSTBL+1         BOUNDARY OF PAGE 1                                $03 00417
000773 124444 A  424          ADD     D2048           =2048                                             $03 00418
000774 054221 A  425          STA     PSTBL+2         BOUNDARY OF PAGE 2                                $03 00419
000775 124442 A  426          ADD     D2048                                                             $03 00420
000776 054220 A  427          STA     PSTBL+3         BOUNDARY OF PAGE 3                                $03 00421
000777 006010 A  428          LDAI    $DBUF                                                             $03 00422
001000 000371 E
001001 057000 I  429          STA     DBUF            INITIALIZE CCS TO PAGE 0                          $03 00423
001002 006010 A  430          LDAI    $DRM1                                                             $03 00424
001003 000372 E
001004 057000 I  431          STA     DRM1            INITIALIZE DCSA TO PAGE 0                         $03 00425
001005 006010 A  432          LDAI    $DRM2                                                             $03 00426
001006 000373 E
001007 057000 I  433          STA     DRM2            INITIALIZE DCSB TO PAGE 0                         $03 00427
001010 005001 A  434          TZA                                                                       $03 00428
001011 006057 A  435          STAE    PGNO            SET PAGE NUMBER TO ZERO                           $03 00429
001012 015112 R
001013 002000 A  436          CALL    TPFRM           TOP OF FORM                                       $03 00430
001014 014760 R
001015 002000 A  437          CALL    SIOUT,14,EXC2     OUTPUT PROGRAM HEADER MESSAGE                   $03 00431
001016 015406 R
001017 000015 A
001020 001060 R
001021 002000 A  438          JMPM    PAG             GET PAGE LIMIT DECLARATION                        $03 00432
001022 001262 R
001023 002000 A  439 EXC1A    CALL    SIOUT,7,EXC5    REQUEST MEMORY TYPE                           F   ********
001024 015406 R
001025 000007 A
001026 001101 R
001027 002000 A  440          CALL    SIIN            GET MEMORY TYPE                               F   ********
001030 015220 R
001031 002000 A  441          JMPM    FETCH                                                         F   ********
001032 015635 R
001033 006140 A  442          SUBI    0260                                                          F   ********
001034 000260 A
001035 005012 A  443          TAB                                                                   F   ********
001036 006140 A  444          SUBI    3                                                             F   ********
001037 000003 A
001040 001004 A  445          JAN     EXC1A           LT 2 NOT VALID                                F   ********
001041 001023 R
001042 006140 A  446          SUBI    3                                                             F   ********
001043 000003 A
001044 001002 A  447          JAP     EXC1A           GT 5 NOT VALID                                F   ********
001045 001023 R
001046 064041 A  448          STB     MTYP            SAVE MEMORY TYPE                              F   ********
       001047 R  449 EXC5     EQU     *                                                             F   ********
001047 005001 A  450          TZA                                                                   F   ********
001050 002000 A  451          JMPM    SAR             ZERO ALL TABLES AND FLAGS                     F   ********
001051 014702 R
001052 000163 A  452          DATA    COMM-V          WORD COUNT                                    F   ********
001053 000476 R  453          DATA    V               START ADDR                                    F   ********
001054 005301 A  454          DECR    01                                                            E.2********
001055 057000 I  455          STA     R5              SET R5 TO ALL 1"S FOR 620 EMULATION           E.2********
001056 001000 A  456          JMP     EXC10           PROCESS OPERATOR INPUT                            $03 00433
001057 001111 R
                 457 *                                                                                  $03 00434
001060 120240 A  458 EXC2     DATA    '  VARIAN 73 MICRO SIMULATOR '                                    $03 00435
001061 130301 A
001062 131311 A
001063 140716 A
001064 120267 A
001065 131640 A
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001066 146711 A
001067 141722 A
001070 147640 A
001071 151711 A
001072 146725 A
001073 146301 A
001074 152317 A
001075 151240 A
001076 000445 R   459 EXC3   DATA   RHLT0          CCS HALT TABLES                                  C 03 00436
001077 000472 R   460        DATA   TRACE          ADDR OF TRACE ON/OFF FLAG                          S03 00437
001100 012060 R   461        DATA   RCNT                                                             S03 00438
001101 120240 A   462 EXC5   DATA   '   MEMORY TYPE?'                                              F  ********
001102 146705 A
001103 146717 A
001104 151331 A
001105 120324 A
001106 154720 A
001107 142677 A
001110 000000 A   463 MTYP   DATA   0              MEMORY TYPE, 3=SC,4=CORE,5=SLOW CORE           F  ********
                  464        EJEC                                                                    S03 00439
                  465 *                                                                              S03 00440
                  466 *      PROCESS OPERATOR INPUT                                                  S03 00441
                  467 *                                                                              S03 00442
001111 002000 A   468 EXC10  CALL   SIOUT,3,EXC4    OUTPUT EXECUTIVE INPUT SIGNAL                   S03 00443
001112 015406 R
001113 000003 A
001114 001155 R
001115 002000 A   469        CALL   SIIN           INPUT EXECUTIVE COMMAND                         S03 00444
001116 015220 R
001117 002000 A   470 EX10E  JMPM   FETCH          FETCH FIRST CHAR FROM INPUT BUFFER              S03 00445
001120 015635 R
001121 001010 A   471        JAZ    EXC90                                                           S03 00446
001122 001147 R
001123 054022 A   472        STA    EXC19          SAVE CHAR                                        S03 00447
001124 024017 A   473        LDB    EXC17          ADDR OF INPUT CHAR LIST                          S03 00448
001125 034017 A   474        LDX    EXC18          CORRESPONDING ROUTINE ADDRESSES                  S03 00449
                  475 *                                                                              S03 00450
001126 016000 A   476 EXC12  LDA    0,2            LEGAL INPUT CHAR                                 S03 00451
001127 001004 A   477        JAN    EXC90          JUMP IF AT END OF TABLE                          S03 00452
001130 001147 R
001131 144014 A   478        SUB    EXC19          LESS INPUT CHAR                                  S03 00453
001132 001010 A   479        JAZ    EXC14          JUMP IF FOUND INPUT                              S03 00454
001133 001140 R
001134 005144 A   480        IXR                                                                    S03 00455
001135 005122 A   481        IBR                                                                    S03 00456
001136 001000 A   482        JMP    EXC12          CHECK NEXT CHAR                                  S03 00457
001137 001126 R
                  483 *                                                                              S03 00458
001140 015000 A   484 EXC14  LDA    0,1            ROUTINE ADDR                                     S03 00459
001141 054001 A   485        STA    EXC16          SAVE FOR JUMP                                    S03 00460
001142 001000 A   486        JMP    *              CALL ROUTINE                                     S03 00461
001143 001142 R
001143            487 EXC16  BES    0              ROUTINE ADDR                                     S03 00462
                  488 *                                                                              S03 00463
001144 000661 R   489 EXC17  DATA   COMM           ADDR OF LEGAL INPUT CHAR LIST                    S03 00464
001145 000700 R   490 EXC18  DATA   COMM1          ROUTINE ADDRESSES                                S03 00465
001146 000000 A   491 EXC19  DATA   0              INPUT CHAR                                       S03 00466
                  492 *                                                                              S03 00467
                  493 *      INVALID INPUT                                                           S03 00468
                  494 *                                                                              S03 00469
001147 002000 A   495 EXC90  CALL   SIOUT,3,EXC92    OUTPUT ERROR MESSAGE                          S03 00470
001150 015406 R
001151 000003 A
001152 001160 R
001153 001000 A   496        JMP    EXC10          GET NEXT INPUT                                   S03 00471
001154 001111 R
                  497 *                                                                              S03 00472
001155 120240 A   498 EXC4   DATA   '   MS**'                                                       S03 00473
001156 146723 A
001157 125252 A
001160 120240 A   499 EXC92  DATA   '   MS01'      INVALID INPUT                                    S03 00474
001161 146723 A
001162 130261 A
                  500        EJEC                                                                    S03 00475
                  501 *                                                                              S03 00476
                  502 *      THIS ROUTINE HANDLES THE PAGE SELECT COMMAND (P)                        S03 00477
                  503 *                                                                              S03 00478
                  504 *           AVAILABLE MEMORY IS TESTED TO DETERMINE IF THERE IS ROOM           S03 00479
                  505 *           FOR THE PAGE AND IN NOT THEN ERROR MESSAGE IS GIVEN                S03 00480
                  506 *                                                                              S03 00481
001163 002000 A   507 PSEL   JMPM   FETCHA         GET PAGE NUMBER                                  S03 00482
001164 015644 R
001165 001010 A   508        JAZ    EXC90                                                           S03 00483
001166 001147 R
001167 006140 A   509        SUBI   0260                                                            S03 00484
001170 000260 A
001171 002000 A   510        CALL   PGOK           CHECK IF PAGE AVAILABEL                          S03 00485
001172 001227 R
001173 001002 A   511        JAP    PSELB          NO ROOM                                          S03 00486
001174 001177 R
001175 001000 A   512        JMP    EXC10                                                           S03 00487
001176 001111 R
001177 002000 A   513 PSELB  CALL   SIOUT,3,NRM     OUTPUT ERROR                                    S03 00488
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001200 015406 R
001201 000003 A
001202 001224 R
001203 005001 A  514          TZA                                                  S03 00489
001204 054006 A  515          STA     PAGE        DEFAULT PAGE                     S03 00490
001205 006057 A  516          STAE    CPAG                                         S03 00491
001206 000503 R
001207 006057 A  517          STAE    PPAG                                         E.2********
001210 000504 R
001211 001000 A  518          JMP     EXC10                                        S03 00492
001212 001111 R
001213 000000 A  519 PAGE     DATA    0                                            S03 00493
001214 001000 E  520 PSTBL    DATA    $DBUF       PAGE 0 BOUNDARY                  S03 00494
001215 000000 A  521          DATA    0           PAGE 1 BOUNDARY                  S03 00495
001216 004000 A  522          DATA    2048        PAGE 2 BOUNDARY                  S03 00496
001217 010000 A  523          DATA    4096        PAGE 3 BOUNDARY                  S03 00497
                 524 *                                                            S03 00498
001220 001003 E  525 DCTBL    DATA    $DRM1       PAGE 0 DCS                       S03 00499
001221 000000 E  526          DATA    $DRM1B      PAGE 1 DCS                     F ********
001222 000000 E  527          DATA    $DRM1C      PAGE 2 DCS                     F ********
001223 000000 E  528          DATA    $DRM1D      PAGE 3 DCS                     F ********
                 529 *                                                            S03 00503
001224 120240 A  530 NRM      DATA    '  MS03'    NO ROOM IN CORE                  S03 00504
001225 146723 A
001226 130263 A
                 531          EJEC                                                 S03 00505
                 532 *                                                            S03 00506
                 533 *        THIS ROUTINE CHECKS IF THERE IS SUFFICIENT CORE FOR THE  S03 00507
                 534 *        DESIRED PAGE                                        S03 00508
                 535 *                                                            S03 00509
                 536 *        CALLING SEQUENCE                                    S03 00510
                 537 *        LDA     PAGE NUMBER                                 S03 00511
                 538 *        CALL    PGOK                                        S03 00512
                 539 *        RETURN A REG POS=NOT ROOM, A REG NEG=ENOUGH ROOM    S03 00513
                 540 *        PAGE TABLE POINTERS UPDATED                         S03 00514
                 541 *                                                            S03 00515
001227 000000 A  542 PGOK     ENTR                                                 S03 00516
001230 057000 I  543          STA     PAGE                                         S03 00517
001231 006057 A  544          STAE    CPAG                                         S03 00518
001232 000503 R
001233 144113 A  545          SUB     PAG4        PAGE LIMIT                       S03 00519
001234 001010 A  546          JAZ     *+4                                          S03 00520
001235 001240 R
001236 001002 A  547          JAP*    PGOK        EXCEED PAGE LIMIT                S03 00521
001237 101227 R
001240 006010 A  548          LDAI    PSTBL       PAGE BOUNDARY TABLE              S03 00522
001241 001214 R
001242 127000 I  549          ADD     PAGE        INDEX INTO TABLE                 S03 00523
001243 005012 A  550          TAB                                                  S03 00524
001244 016000 A  551          LDA     0,2         GET TABLE ADDR                   S03 00525
001245 057000 I  552          STA     DBUF        POINTER INTO TABLE               S03 00526
001246 006010 A  553          LDAI    DCTBL       DCS BOUNDARY TABLE               S03 00527
001247 001220 R
001250 127000 I  554          ADD     PAGE        INDEX INTO TABLE                 S03 00528
001251 005012 A  555          TAB                                                  S03 00529
001252 016000 A  556          LDA     0,2         GET TABLE ADDR                   S03 00530
001253 057000 I  557          STA     DRM1        SET DCSA ADDR                    S03 00531
001254 006120 A  558          ADDI    16                                           S03 00532
001255 000020 A
001256 057000 I  559          STA     DRM2        SET DCSB ADDR                    S03 00533
001257 005301 A  560          DECR    01          SET A NEG                        S03 00534
001260 001000 A  561          JMP*    PGOK                                         S03 00535
001261 101227 R
                 562          EJEC                                                 S03 00536
                 563 *                                                            S03 00537
                 564 *        THIS ROUTINE GETS THE PAGE LIMIT DECLARATION UPON INITIALIZATION  S03 00538
                 565 *        SO THAT MAIN MEMORY CAN BE DETERMINED               S03 00539
                 566 *                                                            S03 00540
                 567 *        CALLING SEQUENCE                                    S03 00541
                 568 *        JMPM    PAG                                         S03 00542
                 569 *        RETURN                                              S03 00543
                 570 *                                                            S03 00544
001262 000000 A  571 PAG      ENTR                                                 S03 00545
001263 002000 A  572          CALL    SIOUT,7,PAG5  OUTPUT REQUEST               F ********
001264 015406 R
001265 000007 A
001266 001350 R
001267 002000 A  573          CALL    SIIN          GET PAGE NUMBER                S03 00547
001270 015220 R
001271 002000 A  574          JMPM    FETCH         GET FIRST CHAR                 S03 00548
001272 015635 R
001273 006140 A  575          SUBI    0260          ASCII ZERO                     S03 00549
001274 000260 A
001275 005012 A  576          TAB                                                  S03 00550
001276 001004 A  577          JAN     PAG2          LESS THAN ZERO                 S03 00551
001277 001333 R
001300 006140 A  578          SUBI    04            ASCII FOUR                     S03 00552
001301 000004 A
001302 001002 A  579          JAP     PAG2          GREATER THAN THREE             S03 00553
001303 001333 R
001304 005021 A  580          TBA                                                  S03 00554
001305 054041 A  581          STA     PAG4                                         S03 00555
001306 002000 A  582          JMPM    FETCHA        CHECK IF MORE INPUT            S03 00556
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001307 015644 R
001310 001010 A  583        JAZ     PAG1                                        S03 00557
001311 001320 R
001312 006140 A  584        SUBI    0240     BLANK                              S03 00558
001313 000240 A
001314 001010 A  585        JAZ     PAG1                                        S03 00559
001315 001320 R
001316 001000 A  586        JMP     PAG2     ERROR--INVALID INPUT               S03 00560
001317 001333 R
001320 014026 A  587 PAG1   LDA     PAG4                                        S03 00561
001321 001010 A  588        JAZ*    PAG      RETURN, PAGE WITHIN SIMULATOR      S03 00562
001322 101262 R
001323 002000 A  589        JMPM    PAVL     CHECK IF ROOM FOR PAGES            S03 00563
001324 001362 R
001325 001004 A  590        JAN     PAG2     NO ROOM                            S03 00564
001326 001333 R
001327 006010 A  591        LDAI    PSTBL    PAGE BOUNDARY TABLE                S03 00565
001330 001214 R
001331 001000 A  592        JMP*    PAG                                         S03 00566
001332 101262 R
001333 002000 A  593 PAG2   CALL    SIOUT,3,PAG6   OUTPUT ERROR                 S03 00567
001334 015406 R
001335 000003 A
001336 001357 R
001337 001000 A  594        JMP     PAG+1    TRY AGAIN                          S03 00568
001340 001263 R
001341 002000 A  595 PAG3   CALL    SIOUT,3,NRM    OUTPUT ERROR                 S03 00569
001342 015406 R
001343 000003 A
001344 001224 R
001345 001000 A  596        JMP     PAG+1    TRY AGAIN                          S03 00570
001346 001263 R
001347 000000 A  597 PAG4   DATA    0        SELECTED LIMIT                     S03 00571
001350 120240 A  598 PAG5   DATA    '  PAGE LIMIT? '                          F  ********
001351 150301 A
001352 143705 A
001353 120314 A
001354 144715 A
001355 144724 A
001356 137640 A
001357 120240 A  599 PAG6   DATA    '  MS04'     INVALID PAGE                  S03 00573
001360 146723 A
001361 130264 R
               600          EJEC                                               S03 00574
               601 *                                                           S03 00575
               602 *    THIS IS A SUBROUTINE TO DETERMINE IF THERE IS ENOUGH MEMORY  S03 00576
               603 *    AVAILABLE FOR THE DESIRED PAGE                         S03 00577
               604 *                                                           S03 00578
               605 *    ENTER:  A REG CONTAINS PAGE NUMBER                     S03 00579
               606 *                                                           S03 00580
               607 *    CALLING SEQUENCE                                       S03 00581
               608 *    JMPM    PAVL                                           S03 00582
               609 *    RETURN                                                 S03 00583
               610 *                                                           S03 00584
               611 *    EXIT:   A REG NEG=NO ROOM; A REG POS=PAGE AVAILABLE    S03 00585
               612 *                                                           S03 00586
001362 000000 A  613 PAVL   ENTR                                               S03 00587
001363 054052 A  614        STA     PA8      SAVE PAGE NUMBER                   S03 00588
001364 024012 A  615        LDB     ELOC                                        S03 00589
001365 026000 A  616        LDB     0,2                                         S03 00590
001366 016000 A  617        LDA     0,2      LAST LOADED LOCATION               S03 00591
001367 054004 A  618        STA     PAV1     STUFF INTO SUBTRACTION OPERAND     S03 00592
001370 024007 A  619        LDB     LLUP                                        S03 00593
001371 026000 A  620        LDB     0,2                                         S03 00594
001372 016000 A  621        LDA     0,2      LAST AVAIL LOCATION                S03 00595
001373 006140 A  622        SUBI    0        OPERAND OVERLAYED BY ABOVE-AREA FOR PAGE  S03 00596
001374 000000 A
001374         623 PAV1     BES     0                                           S03 00597
001375 001000 A  624        JMP     PA1      CHECK IF ENOUGH ROOM               S03 00598
001376 001402 R
               625 *                                                           S03 00599
               626          EXT     $ELOC                                      S03 00600
               627          EXT     V$LLUP                                     S03 00601
001377 000000 E  628 ELOC   DATA    $ELOC    FIRST AVAILABLE LOCATION POINTER  S03 00602
001400 000000 E  629 LLUP   DATA    V$LLUP   LAST AVAILABLE LOCATION POINTER    S03 00603
               630          EXT     $SYST                                      S03 00604
001401 000000 E  631 SYST   DATA    $SYST    POINTER TO SYSTEM FLAG            S03 00605
               632 *                                                           S03 00606
001402 054034 A  633 PA1    STA     PA9                                         S03 00607
001403 144034 A  634        SUB     D2048    PAGE 1                             S03 00608
001404 001002 A  635        JAP     PA2      CHECK FOR NEXT PAGE                S03 00609
001405 001412 R
001406 006030 A  636        LDXI    0                                           S03 00610
001407 000000 A
001410 001000 A  637        JMP     PA5      COMPARE PAGE NUMBER                S03 00611
001411 001432 R
001412 144025 A  638 PA2    SUB     D2048    PAGE 2                             S03 00612
001413 001002 A  639        JAP     PA3      CHECK FOR NEXT PAGE                S03 00613
001414 001421 R
001415 006030 A  640        LDXI    1                                           S03 00614
001416 000001 A
001417 001000 A  641        JMP     PA5      COMPARE PAGE NUMBER                S03 00615
001420 001432 R
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001421 144016 A  642 PA3     SUB     D2048          PAGE 3                                  S03 00616
001422 001002 A  643         JAP     PA4            CHECK FOR NEXT PAGE                     S03 00617
001423 001430 R
001424 006030 A  644         LDXI    2                                                      S03 00618
001425 000002 A
001426 001000 A  645         JMP     PA5            COMPARE PAGE NUMBER                     S03 00619
001427 001432 R
001430 006030 A  646 PA4     LDXI    3                                                      S03 00620
001431 000003 A
001432 005041 A  647 PA5     TXA                                                            S03 00621
001433 144002 A  648         SUB     PA8            DESIRED PAGE                            S03 00622
001434 001000 A  649         JMP*    PAVL           RETURN--A REG SET                       S03 00623
001435 101362 R
001436 000000 A  650 PA8     DATA    0                                                      S03 00624
001437 000000 A  651 PA9     DATA    0                                                      S03 00625
001440 004000 A  652 D2048   DATA    2048           UCS PAGE SIZE (512 64 BIT WORDS)        S03 00626
                 653         EJEC                                                           S03 00627
                 654 *                                                                      S03 00628
                 655 *       THIS ROUTINE WILL CONTROL THE SIMULATED OPERATION           S03 00629
                 656 *       OF THE COMPUTER                                            S03 00630
                 657 *                                                                      S03 00631
                 658 *       ENTER VIA THE BEGIN COMMAND                                S03 00632
                 659 *                                                                      S03 00633
001441           660 S100    BSS     0                                                      S03 00634
001441 017000 I  661         LDA     EXLIM          EXECUTION LIMIT                     E.2*********
001442 057000 I  662         STA     RCNT           RESET RUN COUNT                     E.2*********
001443 017000 I  663         LDA     CPAG                                               E.2*********
001444 057000 I  664         STA     PPAG           SET CURRENT MICRO PAGE              E.2*********
001445 002000 A  665         JMPM    INA             GET START SIMULATION ADDRESS           03 00635
001446 013364 R
001447 147240 A  666         DATA    'N'                                                    03 00636
001450 006030 A  667         LDXI    DROM                                                   S03 00637
001451 000546 R
001452 001020 A  668         JBZ     S101           NO ADDR GIVEN--CONTINUE FROM LAST ADDR  S03 00638
001453 001455 R
001454 055057 A  669         STA     NROM,1                                                 S03 00639
001455 002000 A  670 S101    CALL    FELD           BREAK ROM WORD INTO FIELDS              S03 00640
001456 012766 R
001457 002000 A  671 S102    CALL    LIST           PRINT ROM LOC.AND DECODED FIELDS        S03 00641
001460 014175 R
001461 002000 A  672         CALL    CRAS           DETERMINE NEXT ROM ADDR                 S03 00643
001462 001673 R
001463 002000 A  673         CALL    CRXA           OUTPUT NEXT ROM ADDR TO LINE PRINTER    S03 00644
001464 003347 R
001465 006030 A  674         LDXI    DROM                                                   S03 00645
001466 000546 R
001467 002000 A  675 S103    CALL    S300           DATA LOOP PROCESSING                    S03 00654
001470 003431 R
001471 002000 A  676 S104    CALL    MOPA           MEMORY OPERATIONS                       S03 00655
001472 007172 R
001473 006030 A  677         LDXI    DROM                                                   S03 00656
001474 000546 R
001475 002000 A  678 S108    CALL    X100           DETERMINE STATUS REGISTER SETTINGS      S03 00657
001476 006112 R
001477 002000 A  679         CALL    LTMX           LIST TEST MUX STATUS                    S03 00658
001500 004074 R
001501 002000 A  680 S105    CALL    S106                                                   S03 00659
001502 001507 R
001503 017000 I  681         LDA     CPAG           NEXT MICRO PAGE                     E.2*********
001504 057000 I  682         STA     PPAG           SET CURRENT PAGE TO NEXT PAGE       E.2*********
001505 001000 A  683         JMP     S101           GO UPDATE ROM CONTROL BUFFER            S03 00660
001506 001455 R
                 684 *                                                                      S03 00661
                 685 *       CHECK FOR RETURN TO EXEC (STEP MODE OR RUN COUNT SATISFIED)    S03 00665
001507 000000 A  686 S106    ENTR                                                           S03 00666
001510 006020 A  687         LDBI    STEP                                                   S03 00667
001511 000471 R
001512 016000 A  688         LDA     0,2            STEP/RUN FLAG                           S03 00668
001513 001010 A  689         JAZ     *+4                                                    S03 00669
001514 001517 R
001515 001000 A  690         JMP     EXC10          RETURN TO EXEC (STEP MODE)              S03 00670
001516 001111 R
001517 001400 A  691         JSS3    EXC10          RETURN TO EXEC IF ABORT RUN SET     E.2*********
001520 001111 R
001521 002000 A  692         CALL    S120           CHECK FOR ROM HALT ADDR             E.2*********
001522 001560 R
001523 017000 I  693         LDA     RCNT           MICRO COUNT                             S03 00671
001524 001004 A  694         JAN*    S106           RETURN IF NOT SET                       S03 00672
001525 101507 R
001526 001010 A  695         JAZ     S106A          COUNT SATISFIED                         S03 00673
001527 001534 R
001530 005311 A  696         DAR                                                            S03 00674
001531 057000 I  697         STA     RCNT           DECR RUN COUNT                          S03 00675
001532 001000 A  698         JMP*    S106                                                   S03 00676
001533 101507 R
001534 002000 A  699 S106A   CALL    SIOUT,14,S106B     OUTPUT MESSAGE                      S03 00677
001535 015406 R
001536 000016 A
001537 001542 R
001540 001000 A  700         JMP     EXC10          RETURN TO EXEC                          S03 00678
001541 001111 R
001542 120240 A  701 S106B   DATA    '  EXECUTION LIMIT SATISFIED '                         S03 00679
001543 142730 A
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001544 142703 A
001545 152724 A
001546 144717 A
001547 147240 A
001550 146311 A
001551 146711 A
001552 152240 A
001553 151701 A
001554 152311 A
001555 151706 A
001556 144705 A
001557 142240 A
                    702 *                                                                  S03 00680
                    703 *    CHECK FD ROM HALT ADDR                                        S03 00681
                    704 *    YES-EXIT TO EXEC  NO-NORMAL RETURN                            S03 00682
001560 000000 A     705 S120    ENTR                                                       S03 00683
001561 006030 A     706         LDXI    DROM          ADDR OF ROM FIELDS/DATA              S03 00684
001562 000546 R
001563 006010 A     707         LDAI    RHLT          ROM HALT ADDR                      C 03 00685
001564 000441 R
001565 006127 A     708         ADDE    CPAG          SELECTED PAGE                      C 03 00686
001566 000503 R
001567 005012 A     709         TAB                                                      C 03 00687
001570 026000 A     710         LDB     0,2           PAGE HALT TABLE                    C 03 00688
001571 064007 A     711         STB     S120B         SAVE IT                            C 03 00689
001572 016000 A     712 S120A   LDA     0,2                                              C 03 00690
001573 145057 A     713         SUB     NROM,1                                             S03 00691
001574 001010 A     714         JAZ     S123                                               S03 00692
001575 001610 R
001576 005122 A     715         IBR                   ADVANCE POINTER                      S03 00693
001577 005021 A     716         TBA                                                        S03 00694
001600 006140 A     717         SUBI    RHLT                                               S03 00695
001601 000441 R
001601              718 S120B   BES     0                                                C 03 00696
001602 006140 A     719         SUBI    5             FIVE ALREADY CHECKED ?               S03 00697
001603 000005 A
001604 001004 A     720         JAN     S120A         NO-CHECK NEXT HALT ADDRESS         C 03 00698
001605 001572 R
001606 001000 A     721         RETUM   S120          YES-RETURN                           S03 00699
001607 101560 R
001610 002000 A     722 S123    CALL    SIOUT,5,S111  OUTPUT CCS HALT                      S03 00700
001611 015406 R
001612 000005 A
001613 001616 R
001614 001000 A     723 S121    JMP     EXC10         GO TO EXEC                           S03 00701
001615 001111 R
                    724 *                                                                  S03 00702
001616 120240 A     725 S111    DATA    '  CCS HALT'                                       S03 00703
001617 141703 A
001620 151640 A
001621 144301 A
001622 146324 A
                    726 *                                                                  S03 00704
                    727         EJEC                                                       S03 00705
                    728 *                                                                  S03 00706
                    729 *       GET THE NEXT MAIN MEMORY WORD AND OUTPUT IT TO             S03 00707
                    730 *       THE LD IF IN THE TRACE MODE                                S03 00708
                    731 *                                                                  S03 00709
                    732 *       CALLED BY THE MEMORY OPERATIONS COMPONENT - MOPA           S03 00710
                    733 *                                                                  S03 00711
                    734 *                                                                  S03 00712
                    735 *       CALLING SEQUENCE                                           S03 00713
                    736 *       LDA     ADDR OF V73 MAIN MEMORY WORD                       S03 00714
                    737 *       JMPM    S200                                               S03 00715
                    738 *                                                                  S03 00716
                    739 *       RETURN  WORD IN A REGISTER                                 S03 00717
                    740 *                                                                  S03 00718
001623 000000 A     741 S200    ENTR                                                       S03 00719
001624 054033 A     742         STA     S210          SAVE WORD LOC                        S03 00720
001625 025054 A     743         LDB     MOPC,1                                           F  ********
001626 001020 A     744         JBZ     S205          IF NO MEM REQ                      F  ********
001627 001633 R
001630 005014 A     745         TAX                                                      F  ********
001631 015000 A     746         LDA     0,1           GET WORD                             S03 00721
001632 054026 A     747         STA     S211          SAVE WORD                            S03 00725
       001633 R     748 S205    EQU     *                                                D.103 00726
001633 002000 A     749         JMPM    TRSETA        CHECK IF WITHIN BOUNDS               S03 00730
001634 014715 R
001635 001004 A     750         JAN     S201          NOT IN TRACE BOUNDARIES              S03 00731
001636 001655 R
                    751 *                                                                  S03 00732
                    752 *       OUTPUT ADDR AND WORD TO LD                                 S03 00733
                    753 *                                                                  S03 00734
                    754 *                                                                  S03 00735
001637 006030 A     755         LDXI    S219+4                                             S03 00736
001640 001666 R
001641 024016 A     756         LDB     S210          WORD LOCATION                        S03 00737
001642 002000 A     757         JMPM    DH            CONVERT ADDR TO ASCII                S03 00738
001643 014514 R
001644 006030 A     758         LDXI    S219+7                                           D.103 00739
001645 001671 R
001646 024012 A     759         LDB     S211                                             D.103 00740
001647 002000 A     760         JMPM    DH                                               D.103 00741
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001650 014514 R
001651 002000 A  761          CALL    LDOUT,9,S219  OUTPUT TO LD                          FF  ********
001652 015470 R
001653 000011 A
001654 001662 R
                 762 *                                                                        S03 00743
001655 014003 A  763 S201     LDA     S211          WORD                                     S03 00744
001656 001000 A  764          JMP*    S200          RETURN                                   S03 00745
001657 101623 R
                 765 *                                                                        S03 00746
001660 000000 A  766 S210     DATA    0             SAVED LOCATION OF WORD                   S03 00747
001661 000000 A  767 S211     DATA    0             SAVED WORD                               S03 00748
001662 120240 A  768 S219     DATA    '  MMAD  DDDD  CCCC'                                 D.103 00749
001663 146715 A
001664 140704 A
001665 120240 A
001666 142304 A
001667 142304 A
001670 120240 A
001671 141703 A
001672 141703 A
                 769          EJEC                                                         S03 00750
                 770 *                                                                        S03 00751
                 771 *    ROUTINE TO DETERMINE NEXT ROM ADDRESS                               S03 00752
                 772 *                                                                        S03 00753
                 773 *    CALLING SEQUENCE                                                    S03 00754
                 774 *      CALL    CRAS                                                      S03 00755
                 775 *                                                                        S03 00756
                 776 *      RETU    NEXT ROM ADDR IS STORED IN "NROM". ROM ADDR SELECT IS     S03 00757
                 777 *              A 12 BIT WORD WHERE THE UPPER 4 BITS DESIGNATE A          S03 00758
                 778 *              SPECIFIC 512 CONTROL STORE PAGE.                          S03 00759
                 779 *                                                                        S03 00760
                 780 *      THIS ROUTINE USES THE FOLLOWING FIELDS OF THE CURRENT             S03 00761
                 781 *      CONTROL ROM WORD: T,S,G,TS,AF,FS,MS,MT,&IMC                       S03 00762
                 782 *              ALSO USED: IRG2,INTF,INTA,INPF,&TMUX                      S03 00763
                 783 *                                                                        S03 00764
001673 000000 A  784 CRAS     ENTR                  **                                       S03 00765
001674 006030 A  785          LDXI    DROM          ADDR OF ROM FIELD TABLE                  S03 00766
001675 000546 R
001676 015005 A  786          LDA     XT,1          GET TEST CONTROL FIELD                   S03 00771
001677 001010 A  787          JAZ     *+4                                                    S03 00772
001700 001703 R
001701 001000 A  788          JMP     CR50          TEST STATUS LOGIC? T=0=DISABLE TEST LOGIC S03 00773
001702 002404 R
001703 015006 A  789          LDA     XS,1                                                   S03 00774
001704 006140 A  790          SUBI    2             S=10 ?                                   S03 00775
001705 000002 A
001706 001010 A  791          JAZ     CRA4          YES-                                     S03 00776
001707 002064 R
001710 006120 A  792          ADDI    2             S=0 ?                                    S03 00777
001711 000002 A
001712 001010 A  793          JAZ *   *+4                                                    S03 00778
001713 001716 R
001714 001000 A  794          JMP     CRA5          NO-                                      S03 00779
001715 002073 R
001716 015012 A  795          LDA     XIMC,1        IM FIELD                                 S03 00780
001717 006140 A  796          SUBI    13            IM=D ?                                   S03 00781
001720 000015 A
001721 001010 A  797          JAZ     *+4           YES                                      S03 00782
001722 001725 R
001723 001000 A  798          JMP     CRA0          NO                                       S03 00783
001724 001767 R
001725 005311 A  799          DAR                                                            S03 00784
001726 057000 I  800          STA     IMD           SET BRANCH/PUSH-POP FLAG                 S03 00785
001727 015030 A  801          LDA     XA,1          A FIELD                                  S03 00786
001730 005012 A  802          TAB                                                            S03 00787
001731 006150 A  803          ANAI    4             POP ?                                    S03 00788
001732 000004 A
001733 001010 A  804          JAZ     CRAS1         NO                                       S03 00789
001734 001760 R
001735 015027 A  805          LDA     XB,1          CHECK IF POP WITHOUT JUMP                S03 00790
001736 006150 A  806          ANAI    1             B0 SET ?                                 S03 00791
001737 000001 A
001740 001010 A  807          JAZ     CR34          NO                                       S03 00792
001741 002324 R
001742 006017 A  808          LDAE    JSPT          SW=STACK POINTER                         S03 00793
001743 000502 R
001744 001010 A  809          JAZ     CRAX          STACK EMPTY- DO STANDARD PAGE BRANCH     S03 00794
001745 002363 R
001746 005311 A  810          DAR                   REMOVE TOP ITEM OF STACK                 S03 00795
001747 006057 A  811          STAE    JSPT                                                   S03 00796
001750 000502 R
001751 005012 A  812          TAB                                                      D     03 00797
001752 005001 A  813          TZA                                                      D     03 00798
001753 006056 A  814          STAE    STACK,2       CLEAR ENTRY                        D     03 00799
001754 000506 R
001755 057000 I  815          STA     IMD           CLEAR POP FLAG                     D     03 00800
001756 001000 A  816          JMP     CRAX          PERFORM STANDARD PAGE BRANCH             S03 00801
001757 002363 R
001760 005021 A  817 CRAS1    TBA                                                            S03 00802
001761 006150 A  818          ANAI    2             PUSH ?                                   S03 00803
001762 000002 A
001763 001010 A  819          JAZ     CRA0          NO                                       S03 00804
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001764 001767 R
001765 001000 A  820          JMP     CRAX          YES                                    FF  ********
001766 002363 R
001767 005001 A  821 CRA0     TZA                                                                $03 00806
001770 057000 I  822          STA     IMD           RESET BRANCH/PUSH-POP FLAG               $03 00807
001771 015007 A  823          LDA     XG,1                                                     $03 00808
001772 006150 A  824          ANAI    04            G=X1XX ?                                 $03 00809
001773 000004 A
001774 001010 A  825          JAZ     CRA2          NO-                                      $03 00810
001775 002007 R
                 826 *    T=0 & S=0 & G=X1XX                                                  $03 00811
001776 015061 A  827          LDA     INTF,1        ANY INTERRUPT PENDING ?                  $03 00812
001777 001010 A  828          JAZ     CRA2          NO                                       $03 00813
002000 002007 R
002001 015062 A  829          LDA     INTA,1        GET INTERRUPT ADDRESS FROM I/O ,MASK WITH $03 00814
002002 155000 A  830          ANA     XTS,1         TS FIELD AND USE FOR NEXT ROM ADDR       $03 00815
                 831 **********************************                                       $03 00816
002003 006010 A  832          LDAI    0777          * COMPLETE INTERRUPT SIMULATION WILL NOT  $03 00817
002004 000777 A
002005 001000 A  833          RETU*   CRAS          * BE DONE NOW. USE LAST CONTROL ROM       $03 00818
002006 101673 R
                 834 ********************************** ADDR AS DEFAULT.                        $03 00819
                 835 *    DETERMINE IF NEXT ADDRESS COMES FROM DECODE ROM.                    $03 00820
                 836 *    YES IF: NO INTERRUPT PENDING, AND G=X1XX & IMC=0110 , AND AN        $03 00821
                 837 *            INTERRUPT IS NOT BEING PROCESSED(INPF=0).                   $03 00822
002007 015007 A  838 CRA2     LDA     XG,1                                                     $03 00823
002010 006150 A  839          ANAI    04            G=X1XX ?                                 $03 00824
002011 000004 A
002012 001010 A  840          JAZ     *+4                                                    $03 00825
002013 002016 R
002014 001000 A  841          JMP     CRA2A         CHECK IF BRANCH TO DCS                   $03 00826
002015 002033 R
002016 015012 A  842          LDA     XIMC,1                                                 $03 00827
002017 006140 A  843          SUBI    3             IM = 0011                                $03 00828
002020 000003 A
002021 001010 A  844          JAZ     CRAX          PAGE BRANCH                              $03 00829
002022 002363 R
002023 001000 A  845          JMP     CRA8          NO-                                      FF  ********
002024 002104 R
002025 015067 A  846 CRA2B    LDA     INPF,1        INT BEING PROCESSED FLAG SET ?           $03 00831
002026 001010 A  847          JAZ     CRA3                                                   $03 00832
002027 002044 R
002030 005001 A  848          TZA                                                            $03 00833
002031 001000 A  849          JMP     CRA6          ZERO B-OFFSET AND FORM BASE ADDR         $03 00834
002032 002142 R
002033 015012 A  850 CRA2A    LDA     XIMC,1                                                 $03 00835
002034 006140 A  851          SUBI    3             IM=3                                     $03 00836
002035 000003 A
002036 001010 A  852          JAZ     CRA2C                                                  $03 00837
002037 002057 R
002040 006140 A  853          SUBI    3             IM = 0110                                $03 00838
002041 000003 A
002042 001010 A  854          JAZ     CRA2B         YES                                      $03 00839
002043 002025 R
002044 015012 A  855 CRA3     LDA     XIMC,1        DISABLE D-ROM                            $03 00840
002045 006140 A  856          SUBI    014           ADDR SELECT                              $03 00841
002046 000014 A
002047 001010 A  857          JAZ     CRA6          IF S=0 AND IMC=1100.                     $03 00842
002050 002142 R
002051 006140 A  858          SUBI    2                                                    D   03 00843
002052 000002 A
002053 001010 A  859          JAZ     CRA5          IF REQ I/O & DISABLE D-ROM  IMC=1110   D   03 00844
002054 001673 R
002055 001000 A  860          JMP     CR70A         GET NEXT ADDR FROM DECODE              C 03 00845
002056 003077 R
002057 015000 A  861 CRA2C    LDA     XTS,1         GET PAGE                                 D   03 00846
002060 002000 A  862          CALL    PGOK          SELECT CCS AND DCS FOR PAGE              D   03 00847
002061 001227 R
002062 001000 A  863          JMP     CR70A         GO TO DCS FOR NEXT ADDRESS               D   03 00848
002063 003077 R
                 864 *                                                                        $03 00849
                 865 *                                                                        $03 00850
                 866 *    CHECK FOR PAGE ADDRESS JUMP: YES IF G FIELD NOT=X0XX                $03 00851
                 867 *    IF YES, TS FIELD SPECIFIES A PARTICULAR 512 WORD CONTROL            $03 00852
                 868 *    STORE PAGE.                                                         $03 00853
002064 015007 A  869 CRA4     LDA     XG,1                                                   $03 00854
002065 006150 A  870          ANAI    04            G=X0XX ?                                 $03 00855
002066 000004 A
002067 001010 A  871          JAZ     *+4                                                    $03 00856
002070 002073 R
002071 001000 A  872          JMP     CRAX          NO-FORM PAGE JUMP ADDRESS                $03 00857
002072 002363 R
                 873 *                                                                        $03 00858
                 874 *    IF S=3, GO TEST STATUS CONDITION                                    $03 00859
                 875 *    FORM B-OFFSET PART OF ADDR IF AB FIELD IS NOT 1-OR-2.               $03 00860
                 876 *    OTHERWISE B-OFFSET IS ZERO                                          $03 00861
002073 015006 A  877 CRA5     LDA     XS,1                                                   $03 00862
002074 001010 A  878          JAZ     CRA8                                                   $03 00863
002075 002104 R
002076 006140 A  879          SUBI    3             S=1 OR 2 ?                               $03 00864
002077 000003 A
002100 001010 A  880          JAZ     CR30          S=3: GO TEST STATUS CONDITION            $03 00865
002101 002404 R
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002102 001000 A   881          JMP     CRA7          IF S=1 OR 2 THEN USE TS FOR OFFSET      F  ********
002103 002126 R
                  882 *    DON'T USE TS FIELD FOR B-OFFSET IF I/O REQUEST (IM=E/F)          FF  ********
002104 015012 A   883 CRA8   LDA     XIMC,1                                                      S03 00867
002105 006140 A   884          SUBI    14                                                     FF  ********
002106 000016 A
002107 001010 A   885          JAZ     CRA6          IM=E                                     FF  ********
002110 002142 R
002111 005311 A   886          DAR                   IM=F                                     FF  ********
002112 001010 A   887          JAZ     CRA6                                                       S03 00868
002113 002142 R
002114 015011 A   888          LDA     XAB,1                                                      S03 00869
002115 001010 A   889          JAZ     CRA7          AB FIELD=0                                   S03 00870
002116 002126 R
002117 006140 A   890          SUBI    3                                                          S03 00871
002120 000003 A
002121 001002 A   891          JAP     CRA7          AB=3                                         S03 00872
002122 002126 R
002123 005001 A   892          TZA                                                                S03 00873
002124 001000 A   893          JMP     CRA6                                                       S03 00874
002125 002142 R
                  894 *    FORM B-OFFSET                                                        S03 00875
002126 015011 A   895 CRA7   LDA     XAB,1         AB FIELD                                   C 03 00876
002127 006140 A   896          SUBI    2                                                      C 03 00877
002130 000002 A
002131 001010 A   897          JAZ     CRA6          JUMP IF BIT 1 NOT SET                    C 03 00878
002132 002142 R
002133 015012 A   898          LDA     XIMC,1                                                 D   03 00879
002134 006140 A   899          SUBI    13            IM=D                                     D   03 00880
002135 000015 A
002136 001010 A   900          JAZ     CRA6          DO NOT USE TS                            D   03 00881
002137 002142 R
002140 015000 A   901          LDA     XTS,1         PUT TS FIELD INTO BITS 4-1.                  S03 00882
002141 004241 A   902          LRLA    1             BITS 0 &5-8=0.                               S03 00883
002142 006057 A   903 CRA6   STAE    CRB0          STORAGE FOR B OFFSET.                        S03 00884
002143 003427 R
                  904 *                                                                          S03 00885
                  905 *  FORM BASE ADDRESS: AF FIELD INTO BITS 8-4, BITS3-0 ARE ZERO             S03 00886
002144 015001 A   906 CR10   LDA     XAF,1         GET AF FIELD                                 S03 00887
002145 004244 A   907          LRLA    4             POSITION FOR UPPER 5 BITS OF BASE ADDR       S03 00888
002146 057000 I   908          STA     CRBA          STORAGE FOR BASE ADDR                        S03 00889
                  909 *                                                                          S03 00890
                  910 *    FORM A OFFSET: THE UPPER FOUR BITS ARE ZERO. THE LOWER 5 BITS ARE    S03 00891
                  911 *                   SET BY SELECTING 5 CONTIQUOUS BITS OF INST REG2(IRG2S03 00892
                  912 *                   VIA THE FS FIELD, AND MASKING THEM WITH 5 BITS       S03 00893
                  913 *                   OF THE MT/MS FIELDS, OPEN BIT POSITIONS ARE FORCED   S03 00894
                  914 *                   TO "1"(EX,FOR FS=0: SELECTED IRG2 BITS=0XXXX)        S03 00895
002147 015004 A   915 CR15   LDA     XFS,1                                                      S03 00896
002150 006140 A   916          SUBI    4             FOR FS<4, FORCE UNUSED POSITIONS TO "1"      S03 00897
002151 000004 A
002152 001004 A   917          JAN     CR17          GO PERFORM SPECIAL PROCESSING                S03 00898
002153 002165 R
002154 006130 A   918          ERAI    04340         FORM LSRA TO SELECT THE SPECIFIED 5          S03 00899
002155 004340 A
002156 054713 A   919          STA     CRTS+2        BITS OF IRG2                                 S03 00900
002157 015052 A   920          LDA     IRG2,1                                                     S03 00901
002160 003000 A   921          XEC     CRTS+2        RIGHT JUSTIFY SELECTED BITS                  S03 00902
002161 003072 R
002162 154710 A   922          ANA     CRM1          USE ONLY 5LSB'S                              S03 00903
002163 001000 A   923          JMP     CR30          GO MASK SELECTED IRG2 BITS                   S03 00904
002164 002231 R
                  924 *                                                                          S03 00905
                  925 *    SPECIAL PROCESSING FOR FS<4.                                          S03 00906
002165 015004 A   926 CR17   LDA     XFS,1         FS=0 ?                                       S03 00907
002166 001010 A   927          JAZ     CR23          YES-                                         S03 00908
002167 002227 R
002170 005311 A   928          DAR                   FS=0001 ?                                    S03 00909
002171 001010 A   929          JAZ     CR21          YES-                                         S03 00910
002172 002223 R
002173 005311 A   930          DAR                   FS=0010 ?                                    S03 00911
002174 001010 A   931          JAZ     CR19          YES-                                         S03 00912
002175 002203 R
                  932 *    FS=0011                                                               S03 00913
002176 015072 A   933          LDA     NSTP,1        STEM F/F                                     S03 00914
002177 006130 A   934          ERAI    036           FORCE THE 4 MSB'S TO "1"                     S03 00915
002200 000036 A
002201 001000 A   935          JMP     CR30          GO MASK BITS                                 S03 00916
002202 002231 R
                  936 *    FS=0010                                                               S03 00917
002203 015060 A   937 CR19   LDA     MBYC,1        MEMORY BYTE DESIGNATOR                       S03 00918
002204 054665 A   938          STA     CRTS+2        TEMP STORE                                   S03 00919
002205 015064 A   939          LDA     DS,1          PUT STATUS OF DS F/F                         S03 00920
002206 004241 A   940          LRLA    1             INTO BIT POSITION 1.                         S03 00921
002207 134662 A   941          ERA     CRTS+2                                                     S03 00922
002210 054661 A   942          STA     CRTS+2                                                     S03 00923
002211 015052 A   943          LDA     IRG2,1        PUT BIT ONE                                  S03 00924
002212 004242 A   944          LRLA    2             IRG2 WORD                                    S03 00925
002213 006150 A   945          ANAI    010           MASK OFF BIT POSITION                      C 03 00926
002214 000010 A
002215 134654 A   946          ERA     CRTS+2        INTO BIT POSITION 3.                         S03 00927
002216 054653 A   947          STA     CRTS+2                                                     S03 00928
002217 006110 A   948          ORAI    024           FORCE BITS 4 + 2 TO "1"                      S03 00929
002220 000024 A
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002221 001000 A  949          JMP     CR30          GO MASK BITS                              S03 00930
002222 002231 R
                 950 *   FS=0001                                                            S03 00931
002223 006010 A  951 CR21    LDAI    037           FORCE ALL 5 BITS TO "1"                   S03 00932
002224 000037 A
002225 001000 A  952          JMP     CR30          GO MASK BITS                              S03 00933
002226 002231 R
                 953 *   FS=0000                                                            S03 00934
002227 006010 A  954 CR23    LDAI    037           FORCE ALL 5 BITS TO "1"                   S03 00935
002230 000037 A
                 955 *   COME HERE FOR MASKING OF SELECTED IRG2 BITS.                       S03 00936
                 956 *   FIELD MT MASKS MSB OF SELECTED 5 BITS, THE MS FIELD                S03 00937
                 957 *   MASKS THE OTHER 4 BITS.                                            S03 00938
002231 057000 I  958 CR30     STA     CRAD          TEMP STORE OF SELECTED IRG2 BITS          S03 00939
002232 015003 A  959          LDA     XMT,1         MAKE 5 BIT MASK OUT                       S03 00940
002233 004244 A  960          LRLA    4             OF THE ONE BIT MT FIELD                   S03 00941
002234 135002 A  961          ERA     XMS,1         AND THE 4 BIT MS FIELD.                   S03 00942
002235 157000 I  962          ANA     CRAD          MASK IRG2 BITS.                           S03 00943
002236 057000 I  963          STA     CRAD          STORAGE FOR A-OFFSET                      S03 00944
                 964 *   FORM EFFECTIVE NEXT ROM ADDRESS BY INCLUSIVE ORING                 S03 00945
                 965 *   BASE ADDR & A-OFFSET & B-OFFSET.                                   S03 00946
002237 117000 I  966          ORA     CRBA          BASE ADDR & A-OFFSET                      S03 00947
002240 117000 I  967          ORA     CRBO          & B-OFFSET                                S03 00948
002241           968 CR32     BSS     0                                                       S03 00949
002241 055057 A  969          STA     NROM,1        THIS IS THE NEXT ROM ADDR                 S03 00950
002242 017000 I  970          LDA     IMD           BRANCH PUSH ?                             S03 00951
002243 001002 A  971          JAP*    CRAS          NO-RETURN                                 S03 00952
002244 101673 R
002245 015021 A  972          LDA     XW,1                                                    S03 00953
002246 004254 A  973          LRLA    12            POSITION BIT 12                           S03 00954
002247 054047 A  974          STA     CR33          MASK IN                                   S03 00955
002250 015022 A  975          LDA     XO3,1                                                   S03 00956
002251 004253 A  976          LRLA    11            POSITION BIT 11                           S03 00957
002252 114044 A  977          ORA     CR33          MASK IN                                   S03 00958
002253 054043 A  978          STA     CR33                                                    S03 00959
002254 015023 A  979          LDA     XV,1                                                    S03 00960
002255 004252 A  980          LRLA    10            POSITION BIT 10                           S03 00961
002256 114040 A  981          ORA     CR33          MASK IN                                   S03 00962
002257 054037 A  982          STA     CR33                                                    S03 00963
002260 015024 A  983          LDA     XY,1                                                    S03 00964
002261 004251 A  984          LRLA    9             POSITION BIT 9                            S03 00965
002262 114034 A  985          ORA     CR33          MASK IN                                   S03 00966
002263 054033 A  986          STA     CR33                                                    S03 00967
002264 015025 A  987          LDA     XX,1                                                    S03 00968
002265 004247 A  988          LRLA    7             POSITION BIT 7                            S03 00969
002266 114030 A  989          ORA     CR33          MASK IN                                   S03 00970
002267 054027 A  990          STA     CR33                                                    S03 00971
002270 015026 A  991          LDA     XTC,1                                                   S03 00972
002271 004244 A  992          LRLA    4             POSITION BIT 4                            S03 00973
002272 114024 A  993          ORA     CR33          MASK IN                                   S03 00974
002273 054023 A  994          STA     CR33                                                    S03 00975
002274 015027 A  995          LDA     XB,1                                                    S03 00976
002275 114021 A  996          ORA     CR33          MASK IN                                   S03 00977
002276 005012 A  997          TAB                                                             S03 00978
002277 017000 I  998          LDA     JSPT          STACK COUNT                               S03 00979
002300 006140 A  999          SUBI    16            STACK LIMIT                               S03 00980
002301 000020 A
002302 001002 A 1000          JAP     CR34-4        STACK OVERFLOW--GET ENTRY 0               S03 00981
002303 002320 R
002304 006010 A 1001          LDAI    STACK         LOCATION OF STACK                         S03 00982
002305 000506 R
002306 127000 I 1002          ADD     JSPT          POINTER INTO STACK                        S03 00983
002307 005014 A 1003          TAX                                                             S03 00984
002310 065000 A 1004          STB     0,1           'PUSH ON STACK'                           S03 00985
002311 047000 I 1005          INR     JSPT          UPDATE POINTER                            S03 00986
002312 005001 A 1006          TZA                                                             S03 00987
002313 057000 I 1007          STA     IMD           CLEAR BRANCH PUSH/POP FLAG                S03 00988
002314 054002 A 1008          STA     CR33          CLEAR ADDR WORD                           S03 00989
002315 001000 A 1009          RETU*   CRAS                                                    S03 00990
002316 101673 R
002317 000000 A 1010 CR33     DATA    0                                                       S03 00991
                 1011 *                                                                     S03 00992
                 1012 *                                                                     S03 00993
002320 006010 A 1013          LDAI    STACK                                                   S03 00994
002321 000506 R
002322 001000 A 1014          JMP     *+5           GET ENTRY ZERO                            S03 00995
002323 002327 R
002324 006010 A 1015 CR34     LDAI    STACK         STACK ADDRESS                             S03 00996
002325 000506 R
002326 127000 I 1016          ADD     JSPT          POINTER INTO STACK                        S03 00997
002327 005311 A 1017          DAR                   POINT TO LAST ENTRY                     C 03 00998
002330 005012 A 1018          TAB                                                             S03 00999
002331 016000 A 1019          LDA     0,2           RETURN ADDRESS                            S03 01000
002332 054027 A 1020          STA     CR35                                                    S03 01001
002333 004351 A 1021          LSRA    9             GET PAGE                                  S03 01002
002334 006150 A 1022          ANAI    15                                                      S03 01003
002335 000017 A
002336 002000 A 1023          CALL    PGOK          CHECK IF LEGAL PAGE                   FF  ********
002337 001227 R
002340 001004 A 1024          JAN     *+4           YES                                   FF  ********
002341 002344 R
002342 001000 A 1025          JMP     CRPE          ILLEGAL PAGE JUMP                         S03 01003
002343 002373 R
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002344 014015 A 1026          LDA     CR35            RETURN ADDR                                        S03 01009
002345 006150 A 1027          ANAI    0777            MASK OFF ADDR, LES PAGE NO.                        S03 01010
002346 000777 A
002347 055057 A 1028          STA     NROM,1          SET NEXT CCS ADDR                                  S03 01011
002350 017000 I 1029          LDA     JSPT            JUMP STACK POINTER                               C 03 01012
002351 005311 A 1030          DAR                                                                      C 03 01013
002352 057000 I 1031          STA     JSPT            BUMP STACK POINTER                               C 03 01014
002353 005012 A 1032          TAB                                                                   D    03 01015
002354 005001 A 1033          TZA                                                                   D    03 01016
002355 006056 A 1034          STAE    STACK,2         CLEAR ENTRY                                   D    03 01017
002356 000506 R
002357 057000 I 1035          STA     IMD             CLEAR POP FLAG                                D    03 01018
002360 001000 A 1036          JMP*    CRAS            RETURN                                             S03 01019
002361 101673 R
002362 000000 A 1037 CR35     DATA    0                                                                  S03 01020
                1038 *                                                                                   S03 01021
                1039 *                                                                                   S03 01022
                1040 *                                                                                   S03 01023
                1041 *    COME HERE (SEE CRA4) IF G NOT=X0XX TO SELECT ROM PAGE ADDR.                    S03 01024
                1042 *    IF YES :   PUT TS FIELD BITS INTO CRAZ (BITS 12-9) FOR LATER ORING             S03 01025
                1043 *    WITH THE 9 BIT ADDR.                                                           S03 01026
002363 015000 A 1044 CRAX     LDA     XTS,1           GET TS FIELD                                       S03 01027
002364 002000 A 1045          CALL    PGOK            CHECK IF PAGE AVAILABLE                            S03 01028
002365 001227 R
002366 001002 A 1046          JAP     CRPE            ILLEGAL PAGE                                       S03 01029
002367 002373 R
002370 005001 A 1047          TZA                                                                        S03 01030
002371 001000 A 1048          JMP     CRA6            GO FORM 9-BIT ADDR(512-WORD ROM)                   S03 01031
002372 002142 R
                1049 *                                                                                   S03 01032
                1050 *                                                                                   S03 01033
002373 002000 A 1051 CRPE     CALL    SIOUT,3,CRP       OUTPUT ERROR                                     S03 01034
002374 015406 R
002375 000003 A
002376 002401 R
002377 001000 A 1052          JMP     EXC10                                                              S03 01035
002400 001111 R
002401 120240 A 1053 CRP      DATA    '  MS05'        PAGE JUMP TO UNAVAILABLE PAGE                      S03 01036
002402 146723 A
002403 130265 A
                1054 *                                                                                   S03 01037
                1055 *                                                                                   S03 01038
                1056 *    COME HERE IF T FIELD IS 01,10,OR 11                                            S03 01039
                1057 *     T=01 TEST STATUS CONDITION WITH PREVIOUSLY ESTABLISHED MODE                   S03 01040
                1058 *     T=10 SET TEST MODE AND TEST SELECTED TEST CONDITION.                          S03 01041
                1059 *     T=11 RESET TEST MODE AND TEST SELECTED TEST CONDITION.                        S03 01042
                1060 *                                                                                   S03 01043
                1061 *                                                                                   S03 01044
002404 006140 A 1062 CR50     SUBI    1               T=01 ?                                             S03 01045
002405 000001 A
002406 001010 A 1063          JAZ     CR54            YES-                                               S03 01046
002407 002422 R
002410 006140 A 1064          SUBI    1               T=10 ?                                             S03 01047
002411 000001 A
002412 001010 A 1065          JAZ     CR52            YES-                                               S03 01048
002413 002420 R
                1066 *    T=11: RESET TEST MODE                                                          S03 01049
002414 005001 A 1067          TZA                                                                        S03 01050
002415 054457 A 1068          STA     TMDT            RESET TEST MODE FLAG                               S03 01051
002416 001000 A 1069          JMP     CR54                                                               S03 01052
002417 002422 R
                1070 *    T=10:SET TEST MODE                                                             S03 01053
002420 005301 A 1071 CR52     DECR    01              SET A=-1                                           S03 01054
002421 054453 A 1072          STA     TMDT            SET TEST-MODE-TRUE FLAG                            S03 01055
                1073 *                                                                                   S03 01056
                1074 *    SELECT TEST CONDITION SPECIFIED BY THE G FIELD                                 S03 01057
                1075 *                                                                                   S03 01058
002422 015007 A 1076 CR54     LDA     XG,1            GET G FIELD                                        S03 01059
002423 006120 A 1077          ADDI    TMUX            ADDR OF TEST CONDITIONS TABLE                      S03 01060
002424 000641 R
002425 005012 A 1078          TAB                     IS STATUS CONDITION SELECTED BY                    S03 01061
002426 016000 A 1079          LDA     0,2             G FIELD TRUE ?                                     S03 01062
002427 001010 A 1080          JAZ     CR56            NO-                                                S03 01063
002430 002465 R
002431 015007 A 1081          LDA     XG,1                                                               S03 01064
002432 006140 A 1082          SUBI    5               620/F TEST ?                                       S03 01065
002433 000005 A
002434 001010 A 1083          JAZ     CR60            YES-GO PROCESS                                     S03 01066
002435 002514 R
002436 001000 A 1084          JMP     CR58                                                               S03 01067
002437 002457 R
                1085 *    COME HERE IF TESTED CONDITION(S) TRUE.                                         S03 01068
                1086 *                                                                                   S03 01069
                1087 *    RESET OVERFLOW F/F IF :    T=NOT ZERO AND G=5 AND TEST COND.TRUE AND           S03 01070
                1088 *                               BIT 0 OF IRG2=1                                     S03 01071
                1089 *                               THIS MEANS: RESET OVFL IF DOING JOF,JOFM,           S03 01072
                1090 *                               XOF, OR THE "NOT" EQUIVALENTS                       S03 01073
                1091 *                                                                                   S03 01074
002440 015052 A 1092 CR55     LDA     IRG2,1          IS OVFL BIT OF                                     S03 01075
002441 006150 A 1093          ANAI    1               INST. WORD SET ?                                   S03 01076
002442 000001 A
002443 001010 A 1094          JAZ     CR58            NO-                                                S03 01077
002444 002457 R
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002445 005001 A 1095          TZA                                                    $03 01078
002446 055037 A 1096          STA     OVRFL,1     RESET STORED OVERFLOW              $03 01079
002447 006057 A 1097          STAE    TMUX+0      RESET OVFL OF TMUX                 $03 01080
002450 000641 R
002451 015041 A 1098          LDA     STUS,1      RESET                              $03 01081
002452 006150 A 1099          ANAI    0177377     OVERFLOW(BIT 8)                    $03 01082
002453 177377 A
002454 055041 A 1100          STA     STUS,1      OF STATUS REGISTER                 $03 01083
002455 001001 A 1101          JOF     *+2         RESET 620/F HARDWARE OVFL F/F      $03 01084
002456 002457 R
002457 014415 A 1102 CR58     LDA     TMOT        TEST MODE FLAG TRUE ?              $03 01085
002460 001010 A 1103          JAZ     CR57        NO                                 $03 01086
002461 002475 R
002462 005001 A 1104          TZA                 YES- SET B-OFFSET TO ZERO AND PERFORM  $03 01087
002463 001000 A 1105          JMP     CRA6        STANDARD BASE ADDR/A-OFFSET PROCESSING $03 01088
002464 002142 R
                1106 *                                                               $03 01089
002465 014407 A 1107 CR56     LDA     TMOT        TEST MODE FLAG FALSE ?             $03 01090
002466 001010 A 1108          JAZ     *+4                                            $03 01091
002467 002472 R
002470 001000 A 1109          JMP     CR57        NO                                 $03 01092
002471 002475 R
002472 005001 A 1110          TZA                 YES- SET B-OFFSET TO ZERO AND PERFORM  $03 01093
002473 001000 A 1111          JMP     CRA6        STANDARD NEXT ADDR PROCESSING      $03 01094
002474 002142 R
                1112 *    FORM ROM ADDR FOR TEST CONDITION NOT MET                   $03 01095
                1113 *    BITS 8-5=AF FIELD, BITS 3-1=TS FIELD BITS 2-0, BIT 0= ZERO $03 01096
                1114 *    BIT 4=AF BIT 0-INCLUSIVE OREO-WITH TS FIELD BIT 3.         $03 01097
002475 015001 A 1115 CR57     LDA     XAF,1       GET AF FIELD                       $03 01098
002476 004244 A 1116          LRLA    4                                              $03 01099
002477 054370 A 1117          STA     CRTS        TEMP STORE                         $03 01100
002500 015000 A 1118          LDA     XTS,1                                          $03 01101
002501 004241 A 1119          LRLA    1                                              $03 01102
002502 114365 A 1120          ORA     CRTS                                           $03 01103
002503 055057 A 1121          STA     NROM,1      NEXT CCS ADDR                      $03 01104
002504 006017 A 1122          LDAE    CPAG        PAGE NUMBER                      C 03 01105
002505 000503 R
002506 002000 A 1123          CALL    PGOK        CHEC IF PAGE AVAILABLE             $03 01106
002507 001227 R
002510 001002 A 1124          JAP     CRPE        NO--OUTPUT ERROR                   C03 01107
002511 002373 R
                1125 *                            TEST CONDITION IS MET.             $03 01108
002512 001000 A 1126          RETU*   CRA5        EXIT                               $03 01109
002513 101673 R
                1127 *                                                               $03 01110
                1128 *                                                               $03 01111
                1129 *    620/F JMP/JMPM/XEC TESTING                                 $03 01112
002514 015052 A 1130 CR60     LDA     IRG2,1      GET INST--S/B JMP,JMPM, OR XEC     $03 01113
002515 006150 A 1131          ANAI    0777        LOOK AT 9 LSBS                     $03 01114
002516 000777 A
002517 001010 A 1132          JAZ     CR55        UNCONDITIONAL INST                 $03 01115
002520 002440 R
002521 003012 A 1133          TAB                 SAVE 9 LSB'S                       $03 01116
002522 006150 A 1134          ANAI    06                                             $03 01117
002523 000006 A
002524 006140 A 1135          SUBI    06          "NOT" INST ?                       $03 01118
002525 000006 A
002526 001010 A 1136          JAZ     CR6J        YES-                               $03 01119
002527 002533 R
002530 005001 A 1137          TZA                 NO-                                $03 01120
002531 001000 A 1138          JMP     *+3                                            $03 01121
002532 002534 R
002533 005101 A 1139 CR6J     INCR    01                                             $03 01122
002534 054341 A 1140          STA     CNOT        "NOT" INST FLAG                    $03 01123
002535 005021 A 1141          TBA                                                    $03 01124
002536 005002 A 1142 CR6A     TZB                                                    $03 01125
002537 004541 A 1143          LLSR    1                                              $03 01126
002540 054327 A 1144          STA     CRTS                                           $03 01127
002541 001020 A 1145          JBZ     *+4                                            $03 01128
002542 002545 R
002543 001000 A 1146          JMP     CR6Z        001: CHECK OVFL                    $03 01129
002544 002650 R
002545 024330 A 1147 CR6B     LDB     CNOT        "NOT" TYPE INST ?                  $03 01130
002546 001020 A 1148          JBZ     CR6K        NO-                                $03 01131
002547 002554 R
002550 005002 A 1149          TZB                 YES-                               $03 01132
002551 004342 A 1150          LSRA    2           SKIP NEXT 2 BITS WHICH             $03 01133
002552 001000 A 1151          JMP     CR6D        REPRESENT "NOT" TYPES.             $03 01134
002553 002570 R
002554 004541 A 1152 CR6K     LLSR    1                                              $03 01135
002555 054312 A 1153          STA     CRTS                                           $03 01136
002556 001020 A 1154          JBZ     *+4                                            $03 01137
002557 002562 R
002560 001000 A 1155          JMP     CR6Y        002: CHECK A EQUAL/GREATER THAN ZERO  $03 01138
002561 002673 R
002562 004541 A 1156 CR6C     LLSR    1                                              $03 01139
002563 054304 A 1157          STA     CRTS                                           $03 01140
002564 001020 A 1158          JBZ     *+4                                            $03 01141
002565 002570 R
002566 001000 A 1159          JMP     CR6X        004: CHECK A NEGATIVE              $03 01142
002567 002714 R
002570 004541 A 1160 CR6D     LLSR    1                                              $03 01143
002571 054276 A 1161          STA     CRTS                                           $03 01144
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002572 001020 A 1162          JBZ     *+4                                          S03 01145
002573 002576 R
002574 001000 A 1163          JMP     CR6W        010: CHECK A=0                   S03 01146
002575 002735 R
002576 004541 A 1164 CR6E     LLSR    1                                            S03 01147
002577 054270 A 1165          STA     CRTS                                         S03 01148
002600 001020 A 1166          JBZ     *+4                                          S03 01149
002601 002604 R
002602 001000 A 1167          JMP     CR6V        020: CHECK B=0                   S03 01150
002603 002760 R
002604 004541 A 1168 CR6F     LLSR    1                                            S03 01151
002605 054262 A 1169          STA     CRTS                                         S03 01152
002606 001020 A 1170          JBZ     *+4                                          S03 01153
002607 002612 R
002610 001000 A 1171          JMP     CR6U        040: CHECK X=0                   S03 01154
002611 003003 R
002612 004541 A 1172 CR6G     LLSR    1                                            S03 01155
002613 054254 A 1173          STA     CRTS                                         S03 01156
002614 001020 A 1174          JBZ     *+4                                          S03 01157
002615 002620 R
002616 001000 A 1175          JMP     CR6T        100: CHECK IF SS1 SET            S03 01158
002617 003026 R
002620 004541 A 1176 CR6H     LLSR    1                                            S03 01159
002621 054246 A 1177          STA     CRTS                                         S03 01160
002622 001020 A 1178          JBZ     *+4                                          S03 01161
002623 002626 R
002624 001000 A 1179          JMP     CR6S        200: CHECK IF SS2 SET            S03 01162
002625 003047 R
002626 004541 A 1180 CR6I     LLSR    1                                            S03 01163
002627 001020 A 1181          JBZ     CR55        NO-BUT PREV COND WAS TRUE TO GET HERE  S03 01164
002630 002440 R
002631 014244 A 1182          LDA     CNOT        IS INST A NOT TYPE               S03 01165
002632 001010 A 1183          JAZ     CR6L        NO-                              S03 01166
002633 002642 R
002634 006017 A 1184          LDAE    TMUX+2      SS3 SET?                         S03 01167
002635 000643 R
002636 001010 A 1185          JAZ     CR55        NO-COND. MET-GO CHECK TEST MODE FLAG  S03 01168
002637 002440 R
002640 001000 A 1186          JMP     CR56        GO CHECK TEST MODE FLAG          S03 01169
002641 002465 R
002642 006017 A 1187 CR6L     LDAE    TMUX+2         SS3 SET ?                      03 01170
002643 000643 R
002644 001010 A 1188          JAZ     CR56        NO-GO TEST MODE-FALSE FLAG       S03 01171
002645 002465 R
002646 001000 A 1189          JMP     CR55        YES-GO TEST MODE-TRUE FLAG       S03 01172
002647 002440 R
               1190 *                                                             S03 01173
               1191 *    CHECK OVFL                                               S03 01174
002650 014225 A 1192 CR6Z     LDA     CNOT        IS INST. A "NOT" TYPE ?          S03 01175
002651 001010 A 1193          JAZ     CRZ1        NO-                              S03 01176
002652 002663 R
002653 006017 A 1194          LDAE    TMUX+0      YES-OVERFLOW ON ?                S03 01177
002654 000641 R
002655 001010 A 1195          JAZ     *+4                                          S03 01178
002656 002661 R
002657 001000 A 1196          JMP     CR56        YES-COND.NOT MET                 S03 01179
002660 002465 R
002661 001000 A 1197          JMP     CRZ2        NO-                              S03 01180
002662 002667 R
002663 006017 A 1198 CRZ1     LDAE    TMUX+0      OVFL ON ?                        S03 01181
002664 000641 R
002665 001010 A 1199          JAZ     CR56        NO--CONDITION NOT MET            S03 01182
002666 002465 R
002667 005002 A 1200 CRZ2     TZB                                                  S03 01183
002670 014177 A 1201          LDA     CRTS        GET SHIFTED 9 BITS OF INST. WORD S03 01184
002671 001000 A 1202          JMP     CR6B        YES                              S03 01185
002672 002545 R
               1203 *    CHECK IF A REGISTER(R0) IS POSITIVE                      S03 01186
002673 014202 A 1204 CR6Y     LDA     CNOT        "NOT" INST ?                     S03 01187
002674 001010 A 1205          JAZ     CRY1        NO-                              S03 01188
002675 002704 R
002676 006017 A 1206          LDAE    R0          YES- A=POS?                      S03 01189
002677 000526 R
002700 001004 A 1207          JAN     CRY2        NO-COND MET                      S03 01190
002701 002710 R
002702 001000 A 1208          JMP     CR56                                         S03 01191
002703 002465 R
002704 006017 A 1209 CRY1     LDAE    R0          A=POSITIVE ?                     S03 01192
002705 000526 R
002706 001004 A 1210          JAN     CR56        NO-COND.NOT MET                  S03 01193
002707 002465 R
002710 005002 A 1211 CRY2     TZB                                                  S03 01194
002711 014156 A 1212          LDA     CRTS        GET SHIFTED 9 BITS OF INST. WORD S03 01195
002712 001000 A 1213          JMP     CR6C        YES                              S03 01196
002713 002562 R
               1214 *    CHECK IF A REGISTER(R0) IS NEGATIVE                      S03 01197
002714 014161 A 1215 CR6X     LDA     CNOT        "NOT" INST ?                     S03 01198
002715 001010 A 1216          JAZ     CRX1        NO-                              S03 01199
002716 002725 R
002717 006017 A 1217          LDAE    R0                                           S03 01200
002720 000526 R
002721 001004 A 1218          JAN     CR56        YES-COND NOT MET                 S03 01201
002722 002465 R
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002723 001000 A 1219          JMP     CRX2                                    S03 01202
002724 002731 R
002725 006017 A 1220 CRX1     LDAE    R0                                      S03 01203
002726 000526 R
002727 001002 A 1221          JAP     CR56          NO-COND NOT MET           S03 01204
002730 002465 R
002731 005002 A 1222 CRX2     TZB                                             S03 01205
002732 014135 A 1223          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD  S03 01206
002733 001000 A 1224          JMP     CR6D          YES                       S03 01207
002734 002570 R
                    1225 *    CHECK IF A REGISTER(R0) IS ZERO                 S03 01208
002735 014140 A 1226 CR6W     LDA     CNOT                                    S03 01209
002736 001010 A 1227          JAZ     CRW1                                    S03 01210
002737 002746 R
002740 006017 A 1228          LDAE    R0            A=0?                      S03 01211
002741 000526 R
002742 001010 A 1229          JAZ     CR56          YES-COND NOT MET          S03 01212
002743 002465 R
002744 001000 A 1230          JMP     CRW2                                    S03 01213
002745 002754 R
002746 006017 A 1231 CRW1     LDAE    R0            A=0 ?                     S03 01214
002747 000526 R
002750 001010 A 1232          JAZ     *+4                                     S03 01215
002751 002754 R
002752 001000 A 1233          JMP     CR56          NO-COND NOT MET           S03 01216
002753 002465 R
002754 005002 A 1234 CRW2     TZB                                             S03 01217
002755 014112 A 1235          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD  S03 01218
002756 001000 A 1236          JMP     CR6E          YES                       S03 01219
002757 002576 R
                    1237 *    CHECK IF B REGISTER(R1) IS ZERO                 S03 01220
002760 014115 A 1238 CR6V     LDA     CNOT          "NOT" INST ?              S03 01221
002761 001010 A 1239          JAZ     CRV1          NO-                       S03 01222
002762 002771 R
002763 006017 A 1240          LDAE    R1            B=0 ?                     S03 01223
002764 000527 R
002765 001010 A 1241          JAZ     CR56          YES-COND NOT MET          S03 01224
002766 002465 R
002767 001000 A 1242          JMP     CRV2                                    S03 01225
002770 002777 R
002771 006017 A 1243 CRV1     LDAE    R1            B=0 ?                     S03 01226
002772 000527 R
002773 001010 A 1244          JAZ     *+4                                     S03 01227
002774 002777 R
002775 001000 A 1245          JMP     CR56          NO-COND NOT MET           S03 01228
002776 002465 R
002777 005002 A 1246 CRV2     TZB                                             S03 01229
003000 014067 A 1247          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD  S03 01230
003001 001000 A 1248          JMP     CR6F          YES                       S03 01231
003002 002604 R
                    1249 *    CHECK IF X REGISTER(R2) IS ZERO                 S03 01232
003003 014072 A 1250 CR6U     LDA     CNOT          "NOT" INST ?              S03 01233
003004 001010 A 1251          JAZ     CRU1          NO-                       S03 01234
003005 003014 R
003006 006017 A 1252          LDAE    R2            X=0 ?                     S03 01235
003007 000530 R
003010 001010 A 1253          JAZ     CR56          YES-COND NOT MET          S03 01236
003011 002465 R
003012 001000 A 1254          JMP     CRU2                                    S03 01237
003013 003022 R
003014 006017 A 1255 CRU1     LDAE    R2            X=0 ?                     S03 01238
003015 000530 R
003016 001010 A 1256          JAZ     *+4                                     S03 01239
003017 003022 R
003020 001000 A 1257          JMP     CR56          NO-COND NOT MET           S03 01240
003021 002465 R
003022 005002 A 1258 CRU2     TZB                                             S03 01241
003023 014044 A 1259          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD  S03 01242
003024 001000 A 1260          JMP     CR6G          YES                       S03 01243
003025 002612 R
                    1261 *    CHECK IF SS1 IS SET                             S03 01244
003026 014047 A 1262 CR6T     LDA     CNOT          "NOT" INST ?              S03 01245
003027 001010 A 1263          JAZ     CRT1          NO-                       S03 01246
003030 003037 R
003031 006017 A 1264          LDAE    TMUX+4        SS1 SET ?                 S03 01247
003032 000645 R
003033 001010 A 1265          JAZ     CRT2          NO-COND MET               S03 01248
003034 003043 R
003035 001000 A 1266          JMP     CR56          YES-COND NOT MET          S03 01249
003036 002465 R
003037 006017 A 1267 CRT1     LDAE    TMUX+4        SS1 SET?                  S03 01250
003040 000645 R
003041 001010 A 1268          JAZ     CR56          NO-COND NOT MET           S03 01251
003042 002465 R
003043 005002 A 1269 CRT2     TZB                                             S03 01252
003044 014023 A 1270          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD  S03 01253
003045 001000 A 1271          JMP     CR6H          YES                       S03 01254
003046 002620 R
                    1272 *    CHECK IF SS2 IS SET                             S03 01255
003047 014026 A 1273 CR6S     LDA     CNOT          "NOT" INST ?              S03 01256
003050 001010 A 1274          JAZ     CRS1          NO-                       S03 01257
003051 003060 R
003052 006017 A 1275          LDAE    TMUX+3        SS2 SET ?                 S03 01258
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003053 000644 R
003054 001010 A 1276          JAZ     CRS2          NO-COND. MET                                    S03 01259
003055 003064 R
003056 001000 A 1277          JMP     CR56          YES                                             S03 01260
003057 002465 R
003060 006017 A 1278 CRS1     LDAE    TMUX+3        SS2 SET ?                                       S03 01261
003061 000644 R
003062 001010 A 1279          JAZ     CR56          NO-COND NOT MET                                 S03 01262
003063 002465 R
003064 005002 A 1280 CRS2     TZB                                                                   S03 01263
003065 014002 A 1281          LDA     CRTS          GET SHIFTED 9 BITS OF INST. WORD                S03 01264
003066 001000 A 1282          JMP     CR6I          YES                                             S03 01265
003067 002626 R
                    1283 *                                                                          S03 01266
003070              1284 CRTS     BSS     3         TEMP STORAGE                                    S03 01267
003073 000037 A     1285 CRM1     DATA    037       MASK                                            S03 01268
003074 000020 A     1286 CRM2     DATA    020       MASK                                            S03 01269
003075 000000 A     1287 TMOT     DATA    0         TEST-MODE-TRUE FLAG                             S03 01270
003076 000000 A     1288 CNOT     DATA    0         FLAG FOR "NOT" TYPES OF INSTRUCTIONS            S03 01271
                    1289          EJEC                                                            S03 01272
                    1290 *                                                                        S03 01273
                    1291 *                                                                        S03 01274
                    1292 *                    -DECODE ROM ADDRESS GENERATION-                     S03 01275
                    1293 *    ROUTINE TO SELECT THE NEXT CONTROL ROM ADDRESS FROM THE OUTPUT      S03 01276
                    1294 *    OF THE DECODE ROM                                                   S03 01277
003077 015051 A     1295 CR70A    LDA     IRG1,1        GET IBR                                     S03 01278
003100 005012 A     1296          TAB                                                               S03 01279
003101 004350 A     1297          LSRA    8             GET 8 MSBS                                  S03 01280
003102 006140 A     1298          SUBI    0212          BCS OPCODE                                C 03 01281
003103 000212 A
003104 001010 A     1299          JAZ     BCS                                                       S03 01282
003105 003305 R
003106 015051 A     1300 CR70     LDA     IRG1,1        GET IBR                                     S03 01283
003107 004354 A     1301          LSRA    12            USE BITS 15,14,13,&12                       S03 01284
003110 127000 I     1302          ADD     DRM1          ADDR OF DCSB                                S03 01285
003111 005012 A     1303          TAB                                                               S03 01286
003112 016000 A     1304          LDA     0,2                                                       S03 01287
003113 005002 A     1305          TZB                                                               S03 01288
003114 004444 A     1306          LLRL    4             PUT 4 MSBS IN B REG                         S03 01289
003115 005222 A     1307          CPB                   COMPLEMENT FOR SIMULATOR LOGIC              S03 01290
003116 004474 A     1308          LLRL    28            SHIFT BACK INTO A REG                       S03 01291
003117 054300 A     1309          STA     CR7A          TEMP STORE OF SELECTED DRM1 WORD            S03 01292
                    1310 *                                                                        S03 01293
003120 015051 A     1311          LDA     IRG1,1                                                    S03 01294
003121 006150 A     1312          ANAI    07400         SELECT I1 BITS 11-8                         S03 01295
003122 007400 A
003123 004350 A     1313          LSRA    8             RIGHT JUSTIFY                               S03 01296
003124 127000 I     1314          ADD     DRM2          ADDR OF DCSA                                S03 01297
003125 005012 A     1315          TAB                                                               S03 01298
003126 016000 A     1316          LDA     0,2                                                       S03 01299
003127 054271 A     1317          STA     CR7B          TEMP STORE                                  S03 01300
                    1318 *                                                                        S03 01301
003130 014267 A     1319          LDA     CR7A          TEMP SAVE OF DRM1 WORD                      S03 01302
003131 005002 A     1320          TZB                                                               S03 01303
003132 004441 A     1321          LLRL    1             GET BIT 15                                  S03 01304
003133 064266 A     1322          STB     CR7C          TEMP STORE                                  S03 01305
003134 006150 A     1323          ANAI    020000        GET BIT 12 OF DRM1 WORD                     S03 01306
003135 020000 A
003136 114263 A     1324          ORA     CR7C          INCL-OR BITS 15&12                          S03 01307
003137 001010 A     1325          JAZ     CR71                                                      S03 01308
003140 003160 R
003141 014256 A     1326          LDA     CR7A          TEMP 1                                      S03 01309
003142 004245 A     1327          LRLA    5             BIT "00"=1 ?                                S03 01310
003143 001004 A     1328          JAN     CR73          YES-                                        S03 01311
003144 003151 R
003145 014253 A     1329          LDA     CR7B          TEMP 2                                      S03 01312
003146 006150 A     1330          ANAI    0177760       MASK OUT                                    S03 01313
003147 177760 A
003150 054250 A     1331          STA     CR7B          4 LSB'S OF TEMP 2                           S03 01314
                    1332 *    "OR" 9 LSB'S OF TEMP 1 & TEMP 2 : RESULT INTO TEMP 3                S03 01315
003151 014246 A     1333 CR73     LDA     CR7A          TEMP 1                                      S03 01316
003152 114246 A     1334          ORA     CR7B                                                      S03 01317
003153 006150 A     1335          ANAI    0777                                                      S03 01318
003154 000777 A
003155 054244 A     1336          STA     CR7C          TEMP 3                                      S03 01319
003156 001000 A     1337          JMP     CR72                                                      S03 01320
003157 003164 R
003160 014237 A     1338 CR71     LDA     CR7A          DRM1 WORD                                   S03 01321
003161 006150 A     1339          ANAI    0777                                                      S03 01322
003162 000777 A
003163 054236 A     1340          STA     CR7C          TEMP STORE                                  S03 01323
003164 014233 A     1341 CR72     LDA     CR7A                                                      S03 01324
003165 006150 A     1342          ANAI    040000        IS BIT 14 OF DRM1 "1"                       S03 01325
003166 040000 A
003167 001010 A     1343          JAZ     CR80          NO-                                         S03 01326
003170 003216 R
003171 015051 A     1344 CR74     LDA     IRG1,1        GET I REG #1                                S03 01327
003172 006150 A     1345          ANAI    0360          SELECT BITS 7,6,5,&4                        S03 01328
003173 000360 A
003174 004344 A     1346          LSRA    4             RIGHT JUSTIFY                               S03 01329
003175 054225 A     1347          STA     CR7D          TEMP STORE                                  S03 01330
003176 114223 A     1348          ORA     CR7C                                                      S03 01331
003177 054222 A     1349          STA     CR7C                                                      S03 01332
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003200 001000 A 1350          JMP     CR86        CHECK FOR OVERRRIDE                    S03 01333
003201 003253 R
003202 014215 A 1351 CR76     LDA     CR7A        GET DRM1 WORD                          S03 01334
003203 006150 A 1352          ANAI    020000      IS BIT 13 TRUE                         S03 01335
003204 020000 A
003205 001010 A 1353          JAZ     CR84        NO-                                    S03 01336
003206 003233 R
003207 015051 A 1354 CR77     LDA     IRG1,1      GET IREG #1 WORD                       S03 01337
003210 006150 A 1355          ANAI    017         SELECT BITS 3,2,1,0                    S03 01338
003211 000017 A
003212 054210 A 1356          STA     CR7D        TEMP STORE                             S03 01339
003213 114206 A 1357          ORA     CR7C                                               S03 01340
003214 001000 A 1358          JMP     CR86                                               S03 01341
003215 003253 R
                1359 *                                                                   S03 01342
                1360 *    COME HERE IF S31=0 (BIT 14 OF DRM1)                            S03 01343
003216 005002 A 1361 CR80     TZB                                                        S03 01344
003217 014200 A 1362          LDA     CR7A        SELECT BIT 15                          S03 01345
003220 004441 A 1363          LLRL    1           OF DRM1 WORD                           S03 01346
003221 064202 A 1364          STB     CR7E        TEMP STORE                             S03 01347
003222 014176 A 1365          LDA     CR7B        SELECT BIT 14                          S03 01348
003223 006150 A 1366          ANAI    040000      OF DRM2 WORD                           S03 01349
003224 040000 A
003225 004242 A 1367          LRLA    2           MOVE TO LSB POSITION                   S03 01350
003226 154175 A 1368          ANA     CR7E        "AND" THE TWO BITS                     S03 01351
003227 001010 A 1369          JAZ     CR76                                               S03 01352
003230 003202 R
003231 001000 A 1370          JMP     CR74                                               S03 01353
003232 003171 R
                1371 *                                                                   S03 01354
                1372 *                                                                   S03 01355
                1373 *    COME HERE IF S30=0 (BIT 13 OF DRM1)                            S03 01356
003233 005002 A 1374 CR84     TZB                                                        S03 01357
003234 014163 A 1375          LDA     CR7A        SELECT BIT 15                          S03 01358
003235 004441 A 1376          LLRL    1           OF DRM1                                S03 01359
003236 064165 A 1377          STB     CR7E        TEMP STORE                             S03 01360
003237 014161 A 1378          LDA     CR7B        SELECT BIT 13                          S03 01361
003240 006150 A 1379          ANAI    020000      OF DRM2                                S03 01362
003241 020000 A
003242 004243 A 1380          LRLA    3           MOVE TO LSB POSITION                   S03 01363
003243 154160 A 1381          ANA     CR7E        "AND" THE TWO BITS                     S03 01364
003244 001010 A 1382          JAZ     *+4                                                S03 01365
003245 003250 R
003246 001000 A 1383          JMP     CR77        "AND" THE TWO BITS                     S03 01366
003247 003207 R
003250 014151 A 1384          LDA     CR7C        GENERATED ADDR.                        S03 01367
003251 001000 A 1385          JMP     CR32                                               S03 01368
003252 002241 R
                1386 *                                                                   S03 01369
                1387 *                                                                   S03 01370
                1388 *    IF REGISTER-REGISTER INSTRUCTION, MODIFY THE CONTROL STORE     S03 01371
                1389 *    ADDRESS GENERATED.                                             S03 01372
                1390 *    IF BIT "00" OF TEMP 1(CR7A) AND BIT XX5 OF TEMP 2(CR7B) ARE    S03 01373
                1391 *    BOTH TRUE: PUT BIT 3 OF IRG2 INTO BIT 2 OF GENERATED ADDRESS.  S03 01374
                1392 *                                                                   S03 01375
003253 054146 A 1393 CR86     STA     CR7C        SAVE ADDRESS GENERATED                 S03 01376
003254 014143 A 1394          LDA     CR7A        DRM1 WORD                              S03 01377
003255 006150 A 1395          ANAI    02000       IS "00" BIT TRUE ?                     S03 01378
003256 002000 A
003257 001010 A 1396          JAZ     CR87        NO-                                    S03 01379
003260 003302 R
003261 014137 A 1397          LDA     CR7B                                               S03 01380
003262 006150 A 1398          ANAI    01000       IS BIT "XX5" TRUE ?                    S03 01381
003263 001000 A
003264 001010 A 1399          JAZ     CR87                                               S03 01382
003265 003302 R
003266 014133 A 1400          LDA     CR7C                                               S03 01383
003267 006150 A 1401          ANAI    0177773     CLEAR BIT 2 OF GENERATED ADDR          S03 01384
003270 177773 A
003271 054130 A 1402          STA     CR7C                                               S03 01385
003272 015051 A 1403          LDA     IRG1,1                                             S03 01386
003273 006150 A 1404          ANAI    010         GET BIT 3 OF  IRG1.                    S03 01387
003274 000010 A
003275 004341 A 1405          LSRA    1           MAKE IT BIT 2                          S03 01388
003276 134123 A 1406          ORA     CR7C        OF THE GENERATED ADDR.                 S03 01389
003277 054132 A 1407          STA     CR7C                                               S03 01390
003300 001000 A 1408          JMP     CR76                                               S03 01391
003301 003202 R
                1409 *                                                                   S03 01392
003302 014117 A 1410 CR87     LDA     CR7C                                               S03 01393
003303 001000 A 1411          JMP     CR32                                               S03 01394
003304 002241 R
                1412 *                                                                   S03 01395
                1413 *    COME HERE FOR BCS INSTRUCTION                                  S03 01396
003305 005021 A 1414 BCS      TBA                                                        S03 01397
003306 006150 A 1415          ANAI    037         GET 5 LSBS                             S03 01398
003307 000037 A
003310 054035 A 1416          STA     BCSA                                               S03 01399
003311 006010 A 1417          LDAI    1           SELECT PAGE 1                          S03 01400
003312 000001 A
003313 002000 A 1418          CALL    PGOK        CHECK IF PAGE AVAIL AND SET POINTERS   S03 01401
003314 001227 R
003315 001002 A 1419          JAP     BCSB                                               S03 01402
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003316 003335 R
003317 014026 A 1420          LDA     BCSA            ADDRESS                                  S03 01403
003320 006030 A 1421          LDXI    DROM                                                     S03 01404
003321 000546 R
003322 055057 A 1422          STA     NROM,1          SET NEXT CCS ADDRESS                     S03 01405
003323 006010 A 1423          LDAI    $DRM1                                                    S03 01406
003324 001220 E
003325 006057 A 1424          STAE    DRM1            SET DCSA BACK TO PAGE 0                  S03 01407
003326 000372 R
003327 006120 A 1425          ADDI    16                                                       S03 01408
003330 000020 A
003331 006057 A 1426          STAE    DRM2            SET DCSB BACK TO PAGE 0                  S03 01409
003332 000373 R
003333 001000 A 1427          JMP*    CRAS            RETURN                                   S03 01410
003334 101673 R
003335 002000 A 1428 BCSB     CALL    SIOUT,3,BCSC      OUTPUT ERROR                           S03 01411
003336 015406 R
003337 000003 A
003340 003343 R
003341 001000 A 1429          JMP     EXC10           RETURN, ABORT SIMULATION                 S03 01412
003342 001111 R
003343 120240 A 1430 BCSC     DATA    '  MS06'        BCS--NO PAGE 1                           S03 01413
003344 146723 A
003345 130266 A
003346 000000 A 1431 BCSA     DATA    0               TEMP STORAGE                             S03 01414
                1432 *      PRINT NEXT ROM ADDRESS ON LINE PRINTER                           S03 01415
                1433 *                                                                       S03 01416
003347 000000 A 1434 CRXA     ENTR                                                             S03 01417
003350 002000 A 1435          JMPM    TRSETA          CHECK IF WITHIN TRACE BOUNDS           E.2********
003351 014715 R
003352 001004 A 1436          JAN*    CRXA            RETURN IF NOT TO TRACE                 E.2********
003353 103347 R
003354 002000 A 1437          CALL    SPAC            SPACE LO                                 S03 01421
003355 014747 R
003356 006030 A 1438          LDXI    CRXZ+10                                                  S03 01422
003357 003411 R
003360 006020 A 1439          LDBI    DROM                                                     S03 01423
003361 000546 R
003362 026057 A 1440          LDB     NROM,2                                                   S03 01424
003363 002000 A 1441          CALL    DH                                                       S03 01425
003364 014514 R
003365 017000 I 1442          LDA     CPAG            PAGE NUMBER                              S03 01426
003366 006120 A 1443          ADDI    0260            ASCII                                    S03 01427
003367 000260 A
003370 054026 A 1444          STA     CRXZ+16         STORE IN MESSAGE                         S03 01428
003371 002000 A 1445          CALL    LOOUT,17,CRXZ                                            S03 01429
003372 015470 R
003373 000021 A
003374 003377 R
003375 001060 A 1446          RETU*   CRXA                                                     S03 01430
003376 103347 R
                1447 *      DATA ITEMS                                                       S03 01431
003377 120240 A 1448 CRXZ     DATA    '  NEXT CCS ADDRESS  XXX   PAGE DD'                      S03 01432
003400 147305 A
003401 154324 A
003402 120303 A
003403 141723 A
003404 120301 A
003405 142304 A
003406 151305 A
003407 151723 A
003410 120240 A
003411 120330 A
003412 154330 A
003413 120240 A
003414 120320 A
003415 140707 A
003416 142640 A
003417 142304 A
003420 000000 A 1449 CR7A     DATA    0               TEMP STORE                               S03 01433
003421 000000 A 1450 CR7B     DATA    0               TEMP STORE                               S03 01434
003422 000000 A 1451 CR7C     DATA    0               TEMP STORE                               S03 01435
003423 000000 A 1452 CR7D     DATA    0               TEMP STORE                               S03 01436
003424 000000 A 1453 CR7E     DATA    0               TEMP STORE                               S03 01437
003425 000000 A 1454 CRBA     DATA    0               STORAGE FOR BASE ADDRESS                 S03 01438
003426 000000 A 1455 CRAO     DATA    0               STORAGE FOR A OFFSET                     S03 01439
003427 000000 A 1456 CRBO     DATA    0               STORAGE FOR B OFFSET                     S03 01440
003430 000000 A 1457 CRAZ     DATA    0               STORAGE FOR ROM PAGE ADDR                S03 01441
                1458          EJEC                                                             S03 01442
                1459 *                                                                       S03 01443
                1460 *      DATA LOOP PROCESSING                                             S03 01444
                1461 *                                                                       S03 01445
                1462 *      CALLING SEQUENCE                                                 S03 01446
                1463 *      JMPM    S300                                                     S03 01447
                1464 *                                                                       S03 01448
                1465 *      RETURN  ROM PROCESSING WILL BE COMPLETE                          S03 01449
                1466 *                                                                       S03 01450
003431 000000 A 1467 S300     ENTR                                                             S03 01451
                1468 *                                                                       S03 01452
003432 034224 A 1469          LDX     S316            ADDR OF ROM FIELDS                       S03 01453
003433 002000 A 1470 S302     CALL    DLMS            DETERMINE STATE OF MULTIPLY SIGN         S03 01454
003434 006057 R
                1471 *    IF V FIELD =1--PUT FILE A BIT 15 INTO DS F/F                       S03 01455
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003435 015023 A 1472          LDA     XV,1          V=1 ?                                  S03 01456
003436 001010 A 1473          JAZ     S304                                                 S03 01457
003437 003450 R
                    1474 *    PUT FILE A BIT 15 INTO DS                                    S03 01458
003440 015030 A 1475          LDA     XA,1          FILE A SOURCE ADDR                     S03 01459
003441 006120 A 1476          ADDI    R0            ADDR OF FILE A REGISTERS               S03 01460
003442 000526 R
003443 005012 A 1477          TAB                                                          S03 01461
003444 016000 A 1478          LDA     0,2                                                  S03 01462
003445 005002 A 1479          TZB                                                          S03 01463
003446 004441 A 1480          LLRL    1                                                    S03 01464
003447 065064 A 1481          STB     DS,1          DS IS F/F FOR SIGN STORAGE             S03 01465
003450 002000 A 1482 S304     CALL    X000          DETERMINE LATCH A INPUT                S03 01466
003451 004402 R
003452 055032 A 1483          STA     LTCHA,1       SAVE LATCH A INPUT                     S03 01467
                    1484 *                                                                 S03 01468
003453 002000 A 1485          JMPM    X010          DETERMINE LATCH B INPUT TO ALU         S03 01469
003454 005057 R
003455 055033 A 1486          STA     LTCHB,1       SAVE LATCH B INPUT                     S03 01470
                    1487 *                                                                 S03 01471
003456 002000 A 1488          JMPM    X020          FORM ALU OUTPUT                        S03 01472
003457 005163 R
003460 055034 A 1489          STA     XALU,1        SAVE ALU OUTPUT                        S03 01473
                    1490 *                                                                 S03 01474
003461 002000 A 1491          CALL    DORG          PERFORM OP REGISTER SHIFTING           S03 01475
003462 006624 R
003463 002000 A 1492          CALL    X200          * TRANSFER ALU OUTPUT TO DESIGNATED REGS. S03 01476
003464 007061 R
                    1493 *                                                                 S03 01477
                    1494 *    TRANSFER INST REG #1(IRG1) TO INST REG #2(IRG2) IF           S03 01478
                    1495 *    T=0 & S=0 & G=XXX1                                           S03 01479
003465 015005 A 1496          LDA     XT,1          T FIELD=00                             S03 01480
003466 001010 A 1497          JAZ     *+4                                                  S03 01481
003467 003472 R
003470 001000 A 1498          JMP     S305                                                 S03 01482
003471 003511 R
003472 015007 A 1499          LDA     XG,1          YES-                                   S03 01483
003473 006150 A 1500          ANAI    1             G FIELD=XXX1                           S03 01484
003474 000001 A
003475 001010 A 1501          JAZ     S305                                                 S03 01485
003476 003511 R
003477 015006 A 1502          LDA     XS,1          S=0 ?                                  S03 01486
003500 001010 A 1503          JAZ     *+4                                                  S03 01487
003501 003504 R
003502 001000 A 1504          JMP     S305                                                 S03 01488
003503 003511 R
003504 015052 A 1505          LDA     IRG2,1        SAVE CONTENTS OF IRG2 AT LAST CLOCK.   S03 01489
003505 006050 A 1506          STAI                  USED FOR OVFL SAMPLE FOR               S03 01490
003506 000000 A
003506                1507 XIRG2  BES     0             FAST REG LOGIC. SEE X108.          S03 01491
003507 015051 A 1508          LDA     IRG1,1        YES-MOVE IRG1                          S03 01492
003510 055052 A 1509          STA     IRG2,1        TO IRG2.                               S03 01493
       003511 R 1510 S305     EQU     *                                                    E.S******** *
003511 002000 A 1511          JMPM    TRSETA        CHECK IF WITHIN BOUNDS                 S03 01497
003512 014715 R
003513 001004 A 1512          JAN*    S300          NO--RETURN                             S03 01498
003514 103431 R
                    1513 *                                                                 S03 01499
                    1514 *    OUTPUT TOP OF JUMP STACK TO LD                               S03 01500
                    1515 *                                                                 S03 01501
003515 002000 A 1516          JMPM    SPAC                                                 S03 01502
003516 014747 R
003517 006030 A 1517          LDXI    S320+12                                              S03 01503
003520 003707 R
003521 017000 I 1518          LDA     JSPT          JUMP STACK POINTER                     S03 01504
003522 001010 A 1519          JAZ     *+3                                                  S03 01505
003523 003525 R
003524 005311 A 1520          DAR                   SET BACK TO LAST ITEM ON STACK         S03 01506
003525 006120 A 1521          ADDI    STACK         INDEX INTO STACK                       S03 01507
003526 000506 R
003527 005012 A 1522          TAB                                                          S03 01508
003530 026000 A 1523          LDB     0,2           STACK CONTENTS                         S03 01509
003531 002000 A 1524          JMPM    DH            CONVERT TO ASCII                       S03 01510
003532 014514 R
003533 002000 A 1525          CALL    LDOUT,14,S320                                        S03 01511
003534 015470 R
003535 000016 A
003536 003673 R
003537 017000 I 1526          LDA     JSPT          STACK COUNT                            S03 01512
003540 005012 A 1527          TAB                                                          S03 01513
003541 006140 A 1528          SUBI    012                                                  S03 01514
003542 000012 A
003543 001004 A 1529          JAN     *+5           TWO DIGITS ?                           S03 01515
003544 003550 R
003545 006120 A 1530          ADDI    0130400       YES--PUT 1 IN TENS DIGIT               S03 01516
003546 130400 A
003547 001006 A 1531          DATA    01006         SKIP NEXT INST                         S03 01517
003550 005021 A 1532          TBA                   NO                                     S03 01518
003551 006120 A 1533          ADDI    0260                                                 S03 01519
003552 000260 A
003553 054153 A 1534          STA     S322+14                                              S03 01520
003554 002000 A 1535          CALL    LDOUT,15,S322                                        S03 01521
003555 015470 R
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003556 000017 A
003557 003711 R
                    1536 *                                                                  $03 01522
                    1537 *                                                                  $03 01523
                    1538 *      OUTPUT LATCH A TO LD                                        $03 01524
                    1539 *                                                                  $03 01525
003560 002000 A     1540        JMPM    SPAC            SPACE LD                            $03 01526
003561 014747 R
003562 006010 A     1541        LDAI    0140640         A SPACE                             $03 01527
003563 140640 A
003564 054103 A     1542        STA     S318+7          PLACE IN MESSAGE                    $03 01528
003565 034072 A     1543        LDX     S317                                                $03 01529
003566 024070 A     1544        LDB     S316            ADDR OF ROM FIELDS/DATA             $03 01530
003567 026032 A     1545        LDB     LTCHA,2         LATCH A INPUT TO ALU                $03 01531
003570 002000 A     1546        JMPM    DH              CONVERT TO ASCII                    $03 01532
003571 014514 R
003572 002000 A     1547        CALL    LDOUT,10,S318     OUTPUT LINE                       $03 01533
003573 015470 R
003574 000012 A
003575 003661 R
                    1548 *                                                                  $03 01534
                    1549 *      OUTPUT LATCH B TO LD                                        $03 01535
                    1550 *                                                                  $03 01536
003576 006010 A     1551        LDAI    0141240         B SPACE                             $03 01537
003577 141240 A
003600 054067 A     1552        STA     S318+7          PLACE IN MESSAGE                    $03 01538
003601 034056 A     1553        LDX     S317                                                $03 01539
003602 024054 A     1554        LDB     S316            ADDR OF ROM FIELDS/DATA             $03 01540
003603 026033 A     1555        LDB     LTCHB,2         LATCH B INPUT TO ALU                $03 01541
003604 002000 A     1556        JMPM    DH              CONVERT TO ASCII                    $03 01542
003605 014514 R
003606 002000 A     1557        CALL    LDOUT,10,S318     OUTPUT LINE                       $03 01543
003607 015470 R
003610 000012 A
003611 003661 R
                    1558 *                                                                  $03 01544
                    1559 *      OUTPUT ALU OUTPUT TO LD                                     $03 01545
                    1560 *                                                                  $03 01546
003612 002000 A     1561        JMPM    SPAC            SPACE LD                            $03 01547
003613 014747 R
003614 034113 A     1562        LDX     S319                                                $03 01548
003615 024041 A     1563        LDB     S316            ADDR OF ROM FIELDS/DATA             $03 01549
003616 026034 A     1564        LDB     XALU,2          ALU OUTPUT                          $03 01550
003617 002000 A     1565        JMPM    DH              CONVERT TO ASCII                    $03 01551
003620 014514 R
003621 002000 A     1566        CALL    LDOUT,10,S314     OUTPUT LINE TO LD                 $03 01552
003622 015470 R
003623 000012 A
003624 003731 R
                    1567 *                                                                  $03 01553
                    1568 *      OUTPUT CARRY IN TO LD                                       $03 01554
                    1569 *                                                                  $03 01555
003625 002000 A     1570        JMPM    SPAC            SPACE LD                            $03 01556
003626 014747 R
003627 034027 A     1571        LDX     S316            ADDR OF ROM FIELDS                  $03 01557
003630 015035 A     1572        LDA     XCIN,1          CARRY IN                            $03 01558
003631 006120 A     1573        ADDI    0120260         SPACE ZERO                          $03 01559
003632 120260 A
003633 054114 A     1574        STA     S31D+4                                              $03 01560
003634 002000 A     1575        CALL    LDOUT,5,S31D      OUTPUT MESSAGE                    $03 01561
003635 015470 R
003636 000005 A
003637 003744 R
                    1576 *                                                                  $03 01562
                    1577 *      OUTPUT CARRY OUT TO LD                                      $03 01563
                    1578 *                                                                  $03 01564
003640 034016 A     1579        LDX     S316            ADDR OF ROM FIELDS                  $03 01565
003641 015036 A     1580        LDA     CARRY,1         CARRY                               $03 01566
003642 006120 A     1581        ADDI    0120260         SPACE ZERO                          $03 01567
003643 120260 A
003644 054110 A     1582        STA     S31E+4                                              $03 01568
003645 002000 A     1583        CALL    LDOUT,5,S31E      OUTPUT MESSAGE                    $03 01569
003646 015470 R
003647 000005 A
003650 003751 R
003651 002000 A     1584        JMPM    REGS            DUMP CONTENTS OF REGISTERS          $03 01570
003652 014606 R
                    1585 *                                                                  $03 01571
003653 002000 A     1586        CALL    LTAA            LIST V73 REGISTERS                  $03 01572
003654 003756 R
003655 001000 A     1587        JMP*    S300            RETURN                              $03 01573
003656 103431 R
                    1588 *                                                                  $03 01574
                    1589 *                                                                  $03 01575
003657 000546 R     1590 S316   DATA    DROM            ADDR OF FIRST ROM FIELD             $03 01576
003660 003671 R     1591 S317   DATA    S318+8                                              $03 01577
003661 120240 A     1592 S318   DATA    *       ALU INPUT A DDDD'                           $03 01578
003662 120240 A
003663 140714 A
003664 152640 A
003665 144716 A
003666 150325 A
003667 152240 A
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003670 140640 A
003671 142304 A
003672 142304 A
003673 120240 A 1593 S320    DATA     '  CURRENT TOP OF STACK  DDDD'                    S03 01579
003674 141725 A
003675 151322 A
003676 142716 A
003677 152240 A
003700 152317 A
003701 150240 A
003702 147706 A
003703 120323 A
003704 152301 A
003705 141713 A
003706 120240 A
003707 142304 A
003710 142304 A
003711 120240 A 1594 S322    DATA     '  NUMBER OF ITEMS ON STACK  DD'                 S03 01580
003712 147325 A
003713 146702 A
003714 142722 A
003715 120317 A
003716 143240 A
003717 144724 A
003720 142715 A
003721 151640 A
003722 147716 A
003723 120323 A
003724 152301 A
003725 141713 A
003726 120240 A
003727 142304 A
003730 003741 R 1595 S319    DATA     S31A+8                                          S03 01581
003731 120240 A 1596 S31A    DATA     '     ALU OUTPUT  DDDD'                         S03 01582
003732 120240 A
003733 140714 A
003734 152640 A
003735 147725 A
003736 152320 A
003737 152724 A
003740 120240 A
003741 142304 A
003742 142304 A
003743 000441 R 1597 S31B    DATA     RHLT          CCS HALT ADDRESS                  S03 01583
003744 120240 A 1598 S31D    DATA     '     CIN     '                                 S03 01584
003745 120240 A
003746 141711 A
003747 147240 A
003750 120240 A
003751 120240 A 1599 S31E    DATA     '     COUT    '                                 S03 01585
003752 120240 A
003753 141717 A
003754 152724 A
003755 120240 A
                1600 *                                                               S03 01586
                1601 *                                                               S03 01587
                1602 *      ROUTINE TO LIST V73 REGISTERS TO LINE PRINTER             S03 01588
                1603 *    LISTED:PREG,SREG,OREG,KREG,IOKR,IRG1,IRG2,STUS,IODR        S03 01589
003756 000000 A 1604 LTAA    ENTR                                                    S03 01590
003757 002000 A 1605         JMPM     SPAC          SPACE LO                         S03 01591
003760 014747 R
003761 002000 A 1606         CALL     LOOUT,33,LTAZ   PRINT HEADER                   S03 01592
003762 015470 R
003763 000041 A
003764 004207 R
003765 002000 A 1607         JMPM     PBUF          CLEAR LO BUFFER                  S03 01593
003766 014575 R
003767 006010 A 1608         LDAI     3             REGISTER COUNT                   S03 01594
003770 000003 A
003771 054213 A 1609         STA      LTAX          TEMP STORE                       S03 01595
003772 006010 A 1610         LDAI     DROM+PREG     ADDR OF PREG                     S03 01596
003773 000610 R
003774 054211 A 1611         STA      LTAY                                           S03 01597
003775 006030 A 1612         LDXI     BUFR+1        ADDR OF LO BUFFER                S03 01598
003776 000201 R
003777 024203 A 1613 LTA1    LDB      LTAY          ADDR OF REGISTER FOR LISTING     S03 01599
004000 026000 A 1614         LDB      0,2                                            S03 01600
004001 002000 A 1615         CALL     DH            CONVER 16-BIT WORD TO ASC11      S03 01601
004002 014514 R
004003 005144 A 1616         IXR                    SPACE AFTER DATA                 S03 01602
004004 044201 A 1617         INR      LTAY          STEP TO NEXT REG                 S03 01603
004005 014177 A 1618         LDA      LTAX                                           S03 01604
004006 005311 A 1619         DAR                                                     S03 01605
004007 054175 A 1620         STA      LTAX                                           S03 01606
004010 001010 A 1621         JAZ      *+4                                            S03 01607
004011 004014 R
004012 001000 A 1622         JMP      LTA1          LOOP IF NOT COMPLETE             S03 01608
004013 003777 R
                1623 *    OUTPUT KREG,IOKR,IRG1,+IRG2                                S03 01609
004014 006010 A 1624         LDAI     4                                              S03 01610
004015 000004 A
004016 054166 A 1625         STA      LTAX                                           S03 01611
004017 006010 A 1626         LDAI     DROM+KREG     ADDR OF KREG                     S03 01612
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004020 000615 R
004021 054164 A 1627          STA     LTAY                                    S03 01613
004022 024163 A 1628 LTA2     LDB     LTAY        ADDR OF REGISTER FOR LISTING S03 01614
004023 026000 A 1629          LDB     0,2                                     S03 01615
004024 002000 A 1630          CALL    DH                                      S03 01616
004025 014514 R
004026 005144 A 1631          IXR                                             S03 01617
004027 044156 A 1632          INR     LTAY                                    S03 01618
004030 014154 A 1633          LDA     LTAX                                    S03 01619
004031 005311 A 1634          DAR                                             S03 01620
004032 054152 A 1635          STA     LTAX                                    S03 01621
004033 001010 A 1636          JAZ     *+4                                     S03 01622
004034 004037 R
004035 001000 A 1637          JMP     LTA2        LOOP IF NOT COMPLETE        S03 01623
004036 004022 R
               1638 *                                                         S03 01624
004037 006020 A 1639          LDBI    DROM+STUS   ADDR OF STATUS REG          S03 01625
004040 000607 R
004041 026000 A 1640          LDB     0,2                                     S03 01626
004042 002000 A 1641          CALL    DH                                      S03 01627
004043 014514 R
004044 005144 A 1642          IXR                                             S03 01628
004045 006020 A 1643          LDBI    DROM+IOD    ADDR OF I/O DATA REG        S03 01629
004046 000606 R
004047 026000 A 1644          LDB     0,2                                     S03 01630
004050 002000 A 1645          CALL    DH                                      S03 01631
004051 014514 R
               1646 *                                                         S03 01632
004052 005144 A 1647          IXR                                             S03 01633
004053 006020 A 1648          LDBI    DROM+DS     ADDR OF DS                  S03 01634
004054 000632 R
004055 026000 A 1649          LDB     0,2                                     S03 01635
004056 002000 A 1650          CALL    DH                                      S03 01636
004057 014514 R
004060 005144 A 1651          IXR                                             S03 01637
004061 006020 A 1652          LDBI    DROM+QS     ADDR OF QS                  S03 01638
004062 000631 R
004063 026000 A 1653          LDB     0,2                                     S03 01639
004064 002000 A 1654          CALL    DH                                      S03 01640
004065 014514 R
004066 002000 A 1655          CALL    LOOUT,36,BUFR                           S03 01641
004067 015470 R
004070 000044 A
004071 000200 R
004072 001000 A 1656          RETU*   LTAA                                    S03 01642
004073 103756 R
               1657 *                                                         S03 01643
               1658 *                                                         S03 01644
               1659 *                                                         S03 01645
               1660 *                                                         S03 01646
               1661 *    THE FULL 16 BITS OF EACH STORAGE CELL IS LISTED. EXCEPT FOR THE S03 01647
               1662 *    620/F CONDITION, ZERO OR 1 IS ALL THATS IMPORTANT    S03 01648
               1663 *    LIST TEST CONDITIONS(TMUX TABLE)                     S03 01649
               1664 *    IDENTIFY ON PRINTOUT AS TSMX.                        S03 01650
               1665 *                                                         S03 01651
004074 000000 A 1666 LTMX     ENTR                                            S03 01652
004075 002000 A 1667          JMPM    TRSETA      CHECK IF WITHIN BOUNDS      S03 01656
004076 014715 R
004077 001004 A 1668          JAN*    LTMX        NO-EXIT                     S03 01657
004100 104074 R
004101 002000 A 1669          JMPM    SPAC        SPACE LO                    S03 01658
004102 014747 R
004103 002000 A 1670          CALL    LOOUT,18,LTAS   OUTPUT HEADER           S03 01659
004104 015470 R
004105 000022 A
004106 004250 R
004107 002000 A 1671          CALL    LOOUT,24,LTAT   OUTPUT HEADER           S03 01660
004110 015470 R
004111 000030 A
004112 004272 R
004113 002000 A 1672          JMPM    PBUF        CLEAR LO BUFFER             S03 01661
004114 014575 R
               1673 *                                                         S03 01662
004115 006010 A 1674          LDAI    8                                       S03 01663
004116 000010 A
004117 054065 A 1675          STA     LTAX        WORDS PER LINE              S03 01664
004120 054060 A 1676          STA     LTAW        FLAG FOR OUTPUTTING 2 LINES S03 01665
004121 006010 A 1677          LDAI    TMUX                                    S03 01666
004122 000641 R
004123 054062 A 1678          STA     LTAY                                    S03 01667
004124 006030 A 1679 LTA3     LDXI    BUFR+1                                  S03 01668
004125 000201 R
004126 024057 A 1680 LTA4     LDB     LTAY                                    S03 01669
004127 026000 A 1681          LDB     0,2                                     S03 01670
004130 002000 A 1682          CALL    DH                                      S03 01671
004131 014514 R
004132 005144 A 1683          IXR                                             S03 01672
004133 044052 A 1684          INR     LTAY                                    S03 01673
004134 014050 A 1685          LDA     LTAX                                    S03 01674
004135 005311 A 1686          DAR                                             S03 01675
004136 054046 A 1687          STA     LTAX                                    S03 01676
004137 001010 A 1688          JAZ     *+4                                     S03 01677
004140 004143 R
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004141 001000 A 1689          JMP     LTA4          LOOP IF NOT COMPLETE                    S03 01678
004142 004126 R
004143 014035 A 1690          LDA     LTAW                                                  S03 01679
004144 001010 A 1691          JAZ     *+4                                                   S03 01680
004145 004150 R
004146 001000 A 1692          JMP     LTA5                                                  S03 01681
004147 004162 R
004150 002000 A 1693          CALL    LOOUT,24,LTAP   OUTPUT HEADER                         S03 01682
004151 015470 R
004152 000030 A
004153 004322 R
004154 002000 A 1694          CALL    LOOUT,36,BUFR   PRINT LINE                            S03 01683
004155 015470 R
004156 000044 A
004157 000200 R
004160 001000 A 1695          RETU*   LTMX                                                  S03 01684
004161 104074 R
004162 005001 A 1696 LTA5     TZA                                                           S03 01685
004163 054015 A 1697          STA     LTAW          SET FLAG                                S03 01686
004164 002000 A 1698          CALL    LOOUT,36,BUFR   PRINT LINE                            S03 01687
004165 015470 R
004166 000044 A
004167 000200 R
004170 002000 A 1699          CALL    SPAC          SPACE LO                                S03 01688
004171 014747 R
004172 002000 A 1700          CALL    PBUF          FILL BUFR WITH BLANKS                   S03 01689
004173 014575 R
004174 006010 A 1701          LDAI    8                                                     S03 01690
004175 000010 A
004176 054006 A 1702          STA     LTAX                                                  S03 01691
004177 001000 A 1703          JMP     LTA3          PUT 2ND 8 WORD INTO BUFR                S03 01692
004200 004124 R
004201         1704 LTAW      BSS     4             TEMP STORAGE                            S03 01693
004205 000000 A 1705 LTAX     DATA    0             TEMP STORE OF CONVERSION COUNT          S03 01694
004206 000000 A 1706 LTAY     DATA    0             ADDR OF REG TO LIST                     S03 01695
004207 120240 A 1707 LTAZ     DATA    '   P      SC     OPR    KREG   IOKR   IBR    I      STAT'  S03 01696
004210 150240 A
004211 120240 A
004212 120240 A
004213 151703 A
004214 120240 A
004215 120240 A
004216 147720 A
004217 151240 A
004220 120240 A
004221 145722 A
004222 142707 A
004223 120240 A
004224 144717 A
004225 145722 A
004226 120240 A
004227 144702 A
004230 151240 A
004231 120240 A
004232 144640 A
004233 120240 A
004234 120240 A
004235 151724 A
004236 140724 A
004237 120240 A 1708          DATA    '   IOR    SHFT   QUOS'                            S03 01697
004240 144717 A
004241 151240 A
004242 120240 A
004243 151710 A
004244 143324 A
004245 120240 A
004246 150725 A
004247 147723 A
004250 120240 A 1709 LTAS     DATA    '                  TEST CONDITION STATES'           S03 01698
004251 120240 A
004252 120240 A
004253 120240 A
004254 120240 A
004255 120240 A
004256 120240 A
004257 120324 A
004260 142723 A
004261 152240 A
004262 141717 A
004263 147304 A
004264 144724 A
004265 144717 A
004266 147240 A
004267 151724 A
004270 140724 A
004271 142723 A
004272 120240 A 1710 LTAT     DATA    '   OVFL   SENS   SSW3   SSW2   SSW1   EMUL   ALUO   ALUS'  S03 01699
004273 147726 A
004274 143314 A
004275 120240 A
004276 151705 A
004277 147323 A
004300 120240 A
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004301 151723 A
004302 153663 A
004303 120240 A
004304 151723 A
004305 153662 A
004306 120240 A
004307 151723 A
004310 153661 A
004311 120240 A
004312 142715 A
004313 152714 A
004314 120240 A
004315 140714 A
004316 152717 A
004317 120240 A
004320 140714 A
004321 152723 A
004322 120240 A 1711 LTAP   DATA    ' ALUC  ALUZ  SHFT  MIRS  SFTC  ROAD  NORM  QUDS'        S03 01700
004323 140714 A
004324 152703 A
004325 120240 A
004326 140714 A
004327 152732 A
004330 120240 A
004331 151710 A
004332 143324 A
004333 120240 A
004334 146711 A
004335 151323 A
004336 120240 A
004337 151706 A
004340 152303 A
004341 120240 A
004342 151260 A
004343 140717 A
004344 120240 A
004345 147317 A
004346 151315 A
004347 120240 A
004350 150725 A
004351 147723 A
                1712 *                                                                  S03 01701
                1713 *                                                                  S03 01702
                1714 *                                                                  S03 01703
                1715 *                                                                  S03 01704
                1716 *                                                                  S03 01705
                1717 *   DETERMINE IF SPECIAL ALU MODE: LA=0&LB=0/1&SH=1XX .             S03 01706
                1718 *   IF NOT: INCR RETURN BY 2.                                      S03 01707
004352 000000 A 1719 SALU   ENTR                                                        S03 01708
004353 015014 A 1720        LDA     XLA,1           LA FIELD                            S03 01709
004354 001010 A 1721        JAZ     *+4                                                 S03 01710
004355 004360 R
004356 001000 A 1722        JMP     SAL2                                                S03 01711
004357 004374 R
004360 015013 A 1723        LDA     XLB,1           LB FIELD                            S03 01712
004361 006140 A 1724        SUBI    2                                                   S03 01713
004362 000002 A
004363 001002 A 1725        JAP     SAL2                                                S03 01714
004364 004374 R
004365 015026 A 1726        LDA     XTC,1           3H(MY TC FIELD)                     S03 01715
004366 006150 A 1727        ANAI    4                                                   S03 01716
004367 000004 A
004370 001010 A 1728        JAZ     SAL2                                                S03 01717
004371 004374 R
004372 001000 A 1729        RETU*   SALU                                                S03 01718
004373 104352 R
004374 006047 A 1730 SAL2   INRE    SALU                                                S03 01719
004375 004352 R
004376 006047 A 1731        INRE    SALU                                                S03 01720
004377 004352 R
004400 001000 A 1732        RETU*   SALU                                                S03 01721
004401 104352 R
                1733        EJEC                                                        S03 01722
                1734 *                                                                  S03 01723
                1735 *      DETERMINE LATCH A INPUT TO ALU                              S03 01724
                1736 *                                                                  S03 01725
                1737 *      CALLING SEQUEMCE                                            S03 01726
                1738 *      LDX     ADDR OF ROM DATA FIELDS                             S03 01727
                1739 *      JMPM    X000                                                S03 01728
                1740 *                                                                  S03 01729
                1741 *      RETURN  LATCH A INPUT IN A REGISTER                         S03 01730
                1742 *                                                                  S03 01731
004402 000000 A 1743 X000   ENTR                                                        S03 01732
004403 014447 A 1744        LDA     X009            ADDR OF PSEUDO-REGS                 S03 01733
004404 125030 A 1745        ADD     XA,1            PLUS FILE A SOURCE ADDR             S03 01734
004405 005012 A 1746        TAB                                                         S03 01735
004406 016000 A 1747        LDA     0,2             GET REGISTER CONTENTS               S03 01736
                1748 *                                                                  S03 01737
004407 025014 A 1749        LDB     XLA,1           LATCH A CONTROL                     S03 01738
004410 001020 A 1750        JBZ     XA30            LA=00                               S03 01739
004411 004422 R
004412 005322 A 1751        DBR                                                         S03 01740
004413 001020 A 1752        JBZ     X004            JUMP IF PGM COUNTER IS INPUT        S03 01741
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004414 005047 R
004415 005322 A 1753          DBR                                                    S03 01742
004416 001020 A 1754          JBZ     X002          JUMP IF A LEFT SHIFT             S03 01743
004417 004616 R
004420 001000 A 1755          JMP     XA49          LA=11: RIGHT SHIFT               S03 01744
004421 004500 R
                1756 *                                                               S03 01745
                1757 *                                                               S03 01746
                1758 *                                                               S03 01747
                1759 *    IF LB=0-/R-1 AND TC=001: FORCE LATCH A TO ZERO             S03 01748
                1760 *    IF LB=0-/R-1 AND TC=010: FORCE LATCH A TO ALL 1'S          S03 01749
                1761 *    IF LB=0/1 AND TC=101, SET LATCH A=0 IF IRG2 BIT 7+6=01,10,00. IF  S03 01750
                1762 *    IRG2 BITS 7+6=11(DECR),SET LATCH A=-1                      S03 01751
                1763 *    OTHERWISE, SELECT CONTENTS OF REGISTER DESIGNATED BY A FIELD  S03 01752
004422 005012 A 1764 XA30     TAB             SAVE FILE CONTENTS                     S03 01753
004423 015013 A 1765          LDA     XLB,1                                          S03 01754
004424 006140 A 1766          SUBI    2       LB =0-OR-1 ?                           S03 01755
004425 000002 A
004426 001004 A 1767          JAN     *+5     YES                                    S03 01756
004427 004433 R
004430 005021 A 1768 XA32     TBA             GET FILE REG. CONTENTS                 S03 01757
004431 001000 A 1769          RETU*   X000    EXIT                                   S03 01758
004432 104402 R
004433 015026 A 1770          LDA     XTC,1                                          S03 01759
004434 006150 A 1771          ANAI    4       TC=1XX ?                               S03 01760
004435 000004 A
004436 001010 A 1772          JAZ     *+4                                            S03 01761
004437 004442 R
004440 001000 A 1773          JMP     XS33    YES                                    S03 01762
004441 004460 R
004442 015026 A 1774          LDA     XTC,1                                          S03 01763
004443 006150 A 1775          ANAI    2       TC=X1X ?                               S03 01764
004444 000002 A
004445 001010 A 1776          JAZ     *+4                                            S03 01765
004446 004451 R
004447 001000 A 1777          JMP     XS36    YES                                    S03 01766
004450 004475 R
004451 015026 A 1778          LDA     XTC,1                                          S03 01767
004452 006150 A 1779          ANAI    1       TC=XX1 ?                               S03 01768
004453 000001 A
004454 001010 A 1780          JAZ     XA32    NO-GO GET FILE REG CONTENTS AND EXIT   S03 01769
004455 004430 R
004456 001000 A 1781          JMP     XS34    YES                                    S03 01770
004457 004472 R
004460 015052 A 1782 XS33     LDA     IRG2,1                                         S03 01771
004461 006150 A 1783          ANAI    0300    IF BITS 7&6 OF IRG2 =11,               S03 01772
004462 000300 A
004463 004346 A 1784          LSRA    6       SET LATCH A TO -1.                     S03 01773
004464 006140 A 1785          SUBI    3       IF BITS 7&6 ARE 00,01,10,              S03 01774
004465 000003 A
004466 001010 A 1786          JAZ     XS36    SET LATCH A TO ZERO.                   S03 01775
004467 004475 R
004470 001000 A 1787          JMP     XS34                                           S03 01776
004471 004472 R
004472 005001 A 1788 XS34     TZA             SET LATCH A=0                          S03 01777
004473 001000 A 1789          RETU*   X000                                           S03 01778
004474 104402 R
                1790 *                                                               S03 01779
004475 005301 A 1791 XS36     DECR    01                                             S03 01780
004476 001000 A 1792          RETU*   X000    SET LATCH A=-1                         S03 01781
004477 104402 R
                1793 *                                                               S03 01782
                1794 *                                                               S03 01783
                1795 *                                                               S03 01784
                1796 *                                                               S03 01785
                1797 *    FORM RIGHT SHIFTED LATCH A INPUT                           S03 01786
                1798 *                                                               S03 01787
004500 054351 A 1799 XA49     STA     X008    SAVE FILE A CONTENTS                   S03 01788
004501 006150 A 1800          ANAI    1                                              S03 01789
004502 000001 A
004503 055060 A 1801          STA     MBYC,1  BYTE DESIGNATOR FOR MEMORY OPERATIONS  S03 01790
004504 014345 A 1802          LDA     X008                                           S03 01791
004505 004341 A 1803          LSRA    1                                              S03 01792
004506 054345 A 1804          STA     X00A    TEMP STORE OF SHIFED FILE A            S03 01793
004507 015026 A 1805          LDA     XTC,1   TC FIELD LESS THAN OR                  S03 01794
004510 006140 A 1806          SUBI    4       GREATER THAN 100 ?                     S03 01795
004511 000004 A
004512 001004 A 1807          JAN     XA40    TC<100                                 S03 01796
004513 004522 R
004514 001010 A 1808          JAZ     *+4                                            S03 01797
004515 004520 R
004516 001000 A 1809          JMP     XA48    TC>100                                 S03 01798
004517 004573 R
004520 001000 A 1810          JMP     XA46    TC=100                                 S03 01799
004521 004567 R
004522 015026 A 1811 XA40     LDA     XTC,1   GET TC FIELD                           S03 01800
004523 001010 A 1812          JAZ     *+4     TC = 0 ?                               S03 01801
004524 004527 R
004525 001000 A 1813          JMP     XA41    NO                                     S03 01802
004526 004536 R
                1814 *    TC=000: FA01 INTO LA00 AND MUL SIGN INTO LA15              S03 01803
004527 002000 A 1815          CALL    XA90    PUT FA01 INTO LA00                     S03 01804
004530 005004 R
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004531 015071 A 1816          LDA     MULS,1          MUL SIGN F/F                                    S03 01805
004532 004257 A 1817          LRLA    15                                                              S03 01806
004533 114322 A 1818          ORA     X00D                                                            S03 01807
004534 001000 A 1819          RETU*   X000                                                            S03 01808
004535 104402 R
                1820 *                                                                                S03 01809
004536 006140 A 1821 XA41     SUBI    2               TC= 010 ?                                       S03 01810
004537 000002 A
004540 001010 A 1822          JAZ     XA42            YES-                                            S03 01811
004541 004552 R
004542 001002 A 1823          JAP     XA44            NO: TC=011                                      S03 01812
004543 004561 R
                1824 *    TC=001: FA01 INTO LA00 AND FA00 INTO FA15                                   S03 01813
004544 002000 A 1825            CALL    XA90            PUT FA01 INTO LA00                            S03 01814
004545 005004 R
004546 002000 A 1826            CALL    XA92            PUT FA00 INTO LA15                            S03 01815
004547 005021 R
004550 001000 A 1827            RETU*   X000                                                          S03 01816
004551 104402 R
                1828 *                                                                                S03 01817
                1829 *    TC=010: FA01 INTO LA00 AND FA15 INTO LA15                                   S03 01818
004552 002000 A 1830 XA42       CALL    XA90            PUT FA01 INTO LA00                            S03 01819
004553 005004 R
004554 014275 A 1831          LDA     X008            OR                                              S03 01820
004555 154277 A 1832          ANA     X00C            FA15 BIT                                        S03 01821
004556 114277 A 1833          ORA     X00D            INTO LA15                                       S03 01822
004557 001000 A 1834          RETU*   X000                                                            S03 01823
004560 104402 R
                1835 *                                                                                S03 01824
                1836 *    TC=011: FA01 INTO LA00 AND OR00 INTO LA15                                   S03 01825
004561 002000 A 1837 XA44       CALL    XA90            PUT FA01 INTO LA00                            S03 01826
004562 005004 R
004563 002000 A 1838            CALL    XA96            PUT OR00 INTO LA15                            S03 01827
004564 005037 R
004565 001000 A 1839            RETU*   X000                                                          S03 01828
004566 104402 R
                1840 *                                                                                S03 01829
                1841 *                                                                                S03 01830
                1842 *    TC=100: FA01 INTO LA00 AND "ZERO" INTO LA15                                 S03 01831
004567 002000 A 1843 XA46       CALL    XA90                                                          S03 01832
004570 005004 R
                1844 *    LA15 IS ZERO FROM PREVIOUS LSRA SHIFT                                       S03 01833
004571 001000 A 1845            RETU*   X000            RETURN                                        S03 01834
004572 104402 R
                1846 *                                                                                S03 01835
                1847 *                                                                                S03 01836
004573 015026 A 1848 XA48       LDA     XTC,1                                                         S03 01837
004574 006140 A 1849            SUBI    6               TC=110                                        S03 01838
004575 000006 A
004576 001010 A 1850            JAZ     XA50            YES-                                          S03 01839
004577 004606 R
004600 001002 A 1851            JAP     XA52            NO: TC=111                                    S03 01840
004601 004612 R
                1852 *                                                                                S03 01841
                1853 *    TC=101: FA01 INTO LA00 AND "ZERO" INTO LA15                                 S03 01842
004602 002000 A 1854            CALL    XA90            PUT FA01 INTO LA00                            S03 01843
004603 005004 R
                1855 *    LA15 IS ZERO FROM PREVIOUS LSRA SHIFT                                       S03 01844
004604 001000 A 1856            RETU*   X000                                                          S03 01845
004605 104402 R
                1857 *                                                                                S03 01846
                1858 *    TC=110: FA01 INTO LA00 AND "ZERO" INTO LA15                                 S03 01847
004606 002000 A 1859 XA50       CALL    XA90            PUT FA01 INTO LA00                            S03 01848
004607 005004 R
                1860 *    LA15 IS ZERO FROM PREVIOUS LSRA SHIFT                                       S03 01849
004610 001000 A 1861            RETU*   X000                                                          S03 01850
004611 104402 R
                1862 *                                                                                S03 01851
                1863 *    TC=111: FA01 INTO LA00 AND "ZERO" INTO LA15                                 S03 01852
004612 002000 A 1864 XA52       CALL    XA90            PUT FA01 INTO LA00                            S03 01853
004613 005004 R
                1865 *    LA15 IS ZERO FROM PREVIOUS LSRA SHIFT                                       S03 01854
004614 001000 A 1866            RETU*   X000                                                          S03 01855
004615 104402 R
                1867 *                                                                                S03 01856
                1868 *                                                                                S03 01857
                1869 *                                                                                S03 01858
                1870 *                                                                                S03 01859
                1871 *                                                                                S03 01860
                1872 *    COME HERE IF LA=10: FORM LEFT SHIFTED LATCH A INPUT                         S03 01861
                1873 *                                                                                S03 01862
004616 054233 A 1874 X002       STA     X008            SAVE FILE A CONTENTS                          S03 01863
004617 005002 A 1875            TZB                                                                   S03 01864
004620 004441 A 1876            LLRL    1                                                             S03 01865
004621 054232 A 1877            STA     X00A            TEMP STORE OF SHIFTED FILE A                  S03 01866
004622 015026 A 1878            LDA     XTC,1           GET TC FIELD                                  S03 01867
004623 006140 A 1879            SUBI    4               TC LESS THAN OR GREATER THAN 100 ?            S03 01868
004624 000004 A
004625 001004 A 1880            JAN     XA20            TC<100                                        S03 01869
004626 004665 R
004627 001010 A 1881            JAZ     *+4                                                           S03 01870
004630 004633 R
004631 001000 A 1882            JMP     XA10            TC>100                                        S03 01871
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004632 004637 R
                    1883 *    TC=100: FA15 INTO LA15 AND "ZERO" INTO LA00                    S03 01872
004633 002000 A     1884          CALL    XA80          PUT FA15 INTO LA15                   S03 01873
004634 004726 R
                    1885 *    LA00 IS ZERO FROM ABOVE LLRL OPERATION                         S03 01874
004635 001000 A     1886          RETU*   X000          RETURN                               S03 01875
004636 104402 R
                    1887 *                                                                   S03 01876
                    1888 *                                                                   S03 01877
                    1889 *                                                                   S03 01878
004637 006140 A     1890 XA10     SUBI    2             TC=110 ?                             S03 01879
004640 000002 A
004641 001010 A     1891          JAZ     XA12          YES-                                 S03 01880
004642 004653 R
004643 001002 A     1892          JAP     XA14          NO- TC=111                           S03 01881
004644 004661 R
                    1893 *    TC=101: FA15 INTO LA15 AND FA15 INTO LA00                      S03 01882
004645 002000 A     1894          CALL    XA80          PUT FA15 INTO LA15                   S03 01883
004646 004726 R
004647 002000 A     1895          CALL    XA82          PUT FA15 INTO LA00                   S03 01884
004650 004741 R
004651 001000 A     1896          RETU*   X000          RETURN                               S03 01885
004652 104402 R
                    1897 *                                                                   S03 01886
                    1898 *                                                                   S03 01887
                    1899 *                                                                   S03 01888
                    1900 *    TC=110: FA15 INTO LA15 AND DR15 INTO LA00                      S03 01889
004653 002000 A     1901 XA12     CALL    XA80          PUT FA15 INTO LA15                   S03 01890
004654 004726 R
004655 002000 A     1902          CALL    XA84          PUT DR15 INTO LA00                   S03 01891
004656 004750 R
004657 001000 A     1903          RETU*   X000                                               S03 01892
004660 104402 R
                    1904 *                                                                   S03 01893
                    1905 *                                                                   S03 01894
                    1906 *    TC=111: *** SPARE ***                                          S03 01895
004661 006010 A     1907 XA14     LDAI    0177777       * FLAG- MICROWORD ERROR              S03 01896
004662 177777 A
004663 001000 A     1908          RETU*   X000                                               S03 01897
004664 104402 R
                    1909 *                                                                   S03 01898
                    1910 *    COME HERE IF TC FIELD IS LESS THAN 100.                        S03 01899
                    1911 *                                                                   S03 01900
004665 015026 A     1912 XA20     LDA     XTC,1                                              S03 01901
004666 001010 A     1913          JAZ     *+4                                                S03 01902
004667 004672 R
004670 001000 A     1914          JMP     XA22                                               S03 01903
004671 004676 R
                    1915 *    TC=000: FA14 INTO LA15 AND "ZERO" INTO LA00                    S03 01904
004672 002000 A     1916          CALL    XA88          PUT FA14 INTO LA15                   S03 01905
004673 004767 R
                    1917 *     LA00 IS ZERO FROM PREVIOUS LLRL OPERATION                     S03 01906
004674 001000 A     1918          RETU*   X000                                               S03 01907
004675 104402 R
                    1919 *                                                                   S03 01908
                    1920 *                                                                   S03 01909
004676 006140 A     1921 XA22     SUBI    2             TC=010 ?                             S03 01910
004677 000002 A
004700 001010 A     1922          JAZ     XA24          YES-                                 S03 01911
004701 004712 R
004702 001002 A     1923          JAP     XA26          NO: TC=011                           S03 01912
004703 004720 R
                    1924 *    TC=001: FA14 INTO LA15 AND FA15 INTO LA00                      S03 01913
004704 002000 A     1925          CALL    XA88          PUT FA14 INTO LA15                   S03 01914
004705 004767 R
004706 002000 A     1926          CALL    XA82          PUT FA15 INTO LA00                   S03 01915
004707 004741 R
004710 001000 A     1927          RETU*   X000                                               S03 01916
004711 104402 R
                    1928 *                                                                   S03 01917
                    1929 *    TC=010: FA14 INTO LA15 AND DR15 INTO LA00                      S03 01918
004712 002000 A     1930 XA24     CALL    XA88          PUT FA14 INTO LA15                   S03 01919
004713 004767 R
004714 002000 A     1931          CALL    XA84          PUT DR15 INTO LA00                   S03 01920
004715 004750 R
004716 001000 A     1932          RETU*   X000                                               S03 01921
004717 104402 R
                    1933 *                                                                   S03 01922
                    1934 *    TC=011: SELECTED REG SHIFTED LEFT ONE  LA 1-15  1 INTO LA00    D   03 01923
004720 014131 A     1935 XA26     LDA     X008          REG CONTENTS                         D   03 01924
004721 004241 A     1936          LRLA    1                                                  D   03 01925
004722 006110 A     1937          ORAI    1             1 INTO LA00                          D   03 01926
004723 000001 A
004724 001000 A     1938          RETU*   X000                                               S03 01927
004725 104402 R
                    1939 *                                                                   S03 01928
                    1940 *    STORE BIT 15 OF FILE A INTO BIT 15 OF LATCH A WORD(LEFT SHIFTS) S03 01929
                    1941 *     PUT RESULTS IN X00D                                           S03 01930
004726 000000 A     1942 XA80     ENTR                                                       S03 01931
004727 014124 A     1943          LDA     X00A          GET 15 LSBS                          S03 01932
004730 006150 A     1944          ANAI    077777        OF SHIFTED                           S03 01933
004731 077777 A
004732 054123 A     1945          STA     X00D          WORD WITH NEW LSB                    S03 01934
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004733 014116 A 1946          LDA     X008          MERGE IN                          $03 01935
004734 154120 A 1947          ANA     X00C          BIT 15 OF "OLD"                   $03 01936
004735 134120 A 1948          ERA     X00D          FILE A WORD                       $03 01937
004736 054117 A 1949          STA     X00D          TEMP STORE                        $03 01938
004737 001000 A 1950          JMP*    XA80                                            $03 01939
004740 104726 R
                1951 *                                                                $03 01940
                1952 *                                                                $03 01941
                1953 *    STORE BIT 15 OF FILE A INTO BIT 00 OF LATCH A WORD          $03 01942
004741 000000 A 1954 XA82     ENTR                                                    $03 01943
004742 014107 A 1955          LDA     X008          GET BIT 15                        $03 01944
004743 154111 A 1956          ANA     X00C          OF FILE A.                        $03 01945
004744 004241 A 1957          LRLA    1             MERGE INT.                        $03 01946
004745 134110 A 1958          ERA     X00D          SHIFTED WORD                      $03 01947
004746 001000 A 1959          JMP*    XA82                                            $03 01948
004747 104741 R
                1960 *                                                                $03 01949
                1961 *    STORE BIT 15 OF OP REG. INTO BIT 00 OF LATCH A WORD         $03 01950
004750 000000 A 1962 XA84     ENTR                                                    $03 01951
004751 015044 A 1963          LDA     OREG,1                                          $03 01952
004752 154102 A 1964          ANA     X00C                                            $03 01953
004753 004241 A 1965          LRLA    1                                               $03 01954
004754 134101 A 1966          ERA     X00D          SHIFTED FILE A WITH NEW BIT 15    $03 01955
004755 001000 A 1967          JMP*    XA84                                            $03 01956
004756 104750 R
                1968 *                                                                $03 01957
                1969 *    STORE BIT 14 OF OP REG. INTO BIT 00 OF LATCH A WORD         $03 01958
004757 000000 A 1970 XA86     ENTR                                                    $03 01959
004760 015044 A 1971          LDA     OREG,1                                          $03 01960
004761 006150 A 1972          ANAI    040000                                          $03 01961
004762 040000 A
004763 004242 A 1973          LRLA    2                                               $03 01962
004764 134071 A 1974          ERA     X00D                                            $03 01963
004765 001000 A 1975          JMP*    XA86                                            $03 01964
004766 104757 R
                1976 *                                                                $03 01965
                1977 *    STORE BIT 14 OF FILE A INTO BIT 15 OF LATCH A WORD          $03 01966
                1978 *    PUT RESULTS IN X00D                                         $03 01967
004767 000000 A 1979 XA88     ENTR                                                    $03 01968
004770 014063 A 1980          LDA     X00A          SELECT 15 LSB'S                   $03 01969
004771 006150 A 1981          ANAI    077777        OF SHIFTED                        $03 01970
004772 077777 A
004773 054060 A 1982          STA     X00A          FILE A(NEW LATCH A WORD).         $03 01971
004774 014055 A 1983          LDA     X008          MERGE IN                          $03 01972
004775 006150 A 1984          ANAI    040000        BIT 14 OF                         $03 01973
004776 040000 A
004777 004241 A 1985          LRLA    1             OLD WORD.                         $03 01974
005000 134053 A 1986          ERA     X00A                                            $03 01975
005001 054054 A 1987          STA     X00D          TEMP STORE OF RESULTS             $03 01976
005002 001000 A 1988          JMP*    XA88                                            $03 01977
005003 104767 R
                1989 *                                                                $03 01978
                1990 *    STORE BIT 01 OF FILE A INTO BIT 00 OF LATCH A WORD          $03 01979
                1991 *    PUT RESULTS IN X00D                                         $03 01980
005004 000000 A 1992 XA90     ENTR                                                    $03 01981
005005 014046 A 1993          LDA     X00A          SELECT 15 MSB'S                   $03 01982
005006 006150 A 1994          ANAI    0177776       OF SHIFTED                        $03 01983
005007 177776 A
005010 054043 A 1995          STA     X00A          FILE A WORD.                      $03 01984
005011 014040 A 1996          LDA     X008          MERGE IN                          $03 01985
005012 006150 A 1997          ANAI    02            BIT 01                            $03 01986
005013 000002 A
005014 004341 A 1998          LSRA    1             OF FILE                           $03 01987
005015 134036 A 1999          ERA     X00A          A WORD                            $03 01988
005016 054037 A 2000          STA     X00D          TEMP STORE OF RESULTS             $03 01989
005017 001000 A 2001          JMP*    XA90                                            $03 01990
005020 105004 R
                2002 *                                                                $03 01991
                2003 *    STORE BIT 00 OF FILE A INTO BIT 15 OF LATCH A WORD          $03 01992
005021 000000 A 2004 XA92     ENTR                                                    $03 01993
005022 014027 A 2005          LDA     X008          SELECT BIT 00                     $03 01994
005023 006150 A 2006          ANAI    1             OF FILE A WORD                    $03 01995
005024 000001 A
005025 004257 A 2007          LRLA    15            AND MOVE TO POSITION 15.          $03 01996
005026 134027 A 2008          ERA     X00D          MERGE INTO NEW WORD               $03 01997
005027 001000 A 2009          JMP*    XA92                                            $03 01998
005030 105021 R
                2010 *                                                                $03 01999
                2011 *    STORE BIT 15 OF FILE A INTO BIT 15 OF LATCH A (RIGHT SHIFTS) $03 02000
005031 000000 A 2012 XA94     ENTR                                                    $03 02001
005032 014017 A 2013          LDA     X008          SELECT BIT 15                     $03 02002
005033 154021 A 2014          ANA     X00C          OF FILE A WORD.                   $03 02003
005034 134021 A 2015          ERA     X00D          MERGE INTO NEW WORD               $03 02004
005035 001000 A 2016          JMP*    XA94                                            $03 02005
005036 105031 R
                2017 *                                                                $03 02006
                2018 *    STORE BIT 00 OF OP REG. INTO BIT 15 OF LATCH A WORD         $03 02007
005037 000000 A 2019 XA96     ENTR                                                    $03 02008
005040 015044 A 2020          LDA     OREG,1        SELECT BIT 00                     $03 02009
005041 006150 A 2021          ANAI    1             OF OREG AND                       $03 02010
005042 000001 A
005043 004257 A 2022          LRLA    15            MOVE TO BIT 15 POSITION.          $03 02011
005044 134011 A 2023          ERA     X00D          MERGE INTO LATCH A WORD.          $03 02012
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005045 001000 A 2024          JMP*    XA96                                                    S03 02013
005046 105037 R
                2025 *                                                                        S03 02014
                2026 *        PROGRAM COUNTER IS INPUT                                        S03 02015
                2027 *                                                                        S03 02016
005047 015042 A 2028 X004     LDA     PREG,1          GET PROGRAM COUNTER                     S03 02017
005050 001000 A 2029          JMP*    X000                                                    S03 02018
005051 104402 R
                2030 *                                                                        S03 02019
005052 000000 A 2031 X008     DATA    0               TEMP STORAGE                            S03 02020
005053 000526 R 2032 X009     DATA    R0              ADDR OF PSEUDO-REGS                     S03 02021
005054 000000 A 2033 X00A     DATA    0               TEMP STORE FOR SHIFTED FILE A           S03 02022
005055 100000 A 2034 X00C     DATA    0100000         MASK                                    S03 02023
005056 000000 A 2035 X00D     DATA    0               TEMP STORE OF SHIFTED WORD WITH NEW BIT 15S03 02024
                2036          EJEC                                                            S03 02025
                2037 *                                                                        S03 02026
                2038 *        DETERMINE LATCH B INPUT TO ALU                                  S03 02027
                2039 *                                                                        S03 02028
                2040 *        CALLING SEQUENCE                                                S03 02029
                2041 *        LDX     ADDR OF DATA ROM FIELDS                                 S03 02030
                2042 *        JMPM    X010                                                    S03 02031
                2043 *                                                                        S03 02032
                2044 *        RETURN  LATCH B INPUT TO ALU IN A REGISTER                      S03 02033
                2045 *                                                                        S03 02034
005057 000000 A 2046 X010     ENTR                                                            S03 02035
005060 015027 A 2047          LDA     XB,1            FILE B SOURCE ADDR                      S03 02036
005061 124100 A 2048          ADD     X019            PLUS ADDR OF PSEUDO REGS                S03 02037
005062 005012 A 2049          TAB                                                             S03 02038
005063 016000 A 2050          LDA     0,2             REGISTER CONTENTS                       S03 02039
                2051 *                                                                        S03 02040
005064 025013 A 2052          LDB     XLB,1           LATCH B CONTROL                         S03 02041
005065 001020 A 2053          JBZ*    X010            RETURN IF REG CONTENTS IS INPUT         S03 02042
005066 105057 R
005067 005322 A 2054          DBR                                                             S03 02043
005070 001020 A 2055          JBZ     X012            B MUX INPUT                             S03 02044
005071 005103 R
005072 015031 A 2056          LDA     MASK,1          16-BIT MASK                             S03 02045
005073 005322 A 2057          DBR                                                             S03 02046
005074 001020 A 2058          JBZ     *+4             JUMP IF I1 AND MASK                     S03 02047
005075 005100 R
005076 001000 A 2059          JMP*    X010            MASK IS INPUT                           S03 02048
005077 105057 R
005100 155052 A 2060          ANA     IRG2,1          MASK INSTRUCTION WORD                   S03 02049
005101 001000 A 2061          JMP*    X010            RETURN WITH MASK RESULT                 S03 02050
005102 105057 R
                2062 *                                                                        S03 02051
                2063 *                                                                        S03 02052
                2064 *    COME HERE IF LB FIELD=01: SELECT B MUX FOR INPUT TO LATCH B         S03 02053
                2065 *      INPUTS ARE OP REG, MAIN MEM. DATA REG, I/O DATA REG, STATUS       S03 02054
                2066 *      REG, AND 4 CONFIGURATIONS OF BYTES FROM THE OP REG.               S03 02055
                2067 *                                                                        S03 02056
                2068 *                                                                        S03 02057
005103 015027 A 2069 X012     LDA     XB,1            FILE B SOURCE ADDR                      S03 02058
005104 006150 A 2070          ANAI    7               3 LSB OF ADDR                           S03 02059
005105 000007 A
005106 005012 A 2071          TAB                     SAVE FOR DATA SELECTION                 S03 02060
                2072 *                                                                        S03 02061
005107 015044 A 2073          LDA     OREG,1                                                  S03 02062
005110 001020 A 2074          JBZ*    X010            RETURN: INPUT IS OREG                   S03 02063
005111 105057 R
                2075 *                                                                        S03 02064
005112 015056 A 2076          LDA     MIL,1           MEMORY INTERFACE LATCH                  S03 02065
005113 005322 A 2077          DBR                     B=X001                                  S03 02066
005114 001020 A 2078          JBZ*    X010            RETURN                                  S03 02067
005115 105057 R
                2079 *                                                                        S03 02068
005116 015040 A 2080          LDA     IOD,1           IOD                                     S03 02069
005117 005322 A 2081          DBR                     B=X010                                  S03 02070
005120 001020 A 2082          JBZ*    X010            RETURN IF IOD INPUT                     S03 02071
005121 105057 R
005122 015041 A 2083          LDA     STUS,1          STATUS                                  S03 02072
005123 005322 A 2084          DBR                     B=X011                                  S03 02073
005124 001020 A 2085          JBZ*    X010            RETURN IF STUS INPUT                    S03 02074
005125 105057 R
005126 005322 A 2086          DBR                     B=X100                                  S03 02075
005127 001020 A 2087          JBZ     X013            OP1 RIGHT BYTE/SIGN EXTENDED            S03 02076
005130 005145 R
                2088 *                                                                        S03 02077
005131 005322 A 2089          DBR                     B=X101                                  S03 02078
005132 001020 A 2090          JBZ     X014            OP1 LEFT BYTE/SIGN EXTENDED             S03 02079
005133 005152 R
                2091 *                                                                        S03 02080
005134 005322 A 2092          DBR                     B=X110                                  S03 02081
005135 001020 A 2093          JBZ     X015            OP1 RIGHT BYTE TO RIGHT BYTE            S03 02082
005136 005155 R
                2094 *                                                                        S03 02083
                2095 *    B=X111  OP1 RIGHT BYTE TO LEFT BYTE                                 S03 02084
                2096 *                                                                        S03 02085
005137 015044 A 2097          LDA     OREG,1          GET OPERAND REG                         S03 02086
005140 006150 A 2098          ANAI    0377            MASK OUT RIGHT BYTE                     S03 02087
005141 000377 A
005142 004250 A 2099          LRLA    8               LEFT JUSTIFY BYTE                       S03 02088
005143 001000 A 2100          JMP*    X010            RETURN                                  S03 02089
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005144 105057 R
                    2101 *                                                                  S03 02090
                    2102 *      B=X100  OP1 RIGHT BYTE/SIGN EXTENDED                        S03 02091
                    2103 *                                                                  S03 02092
005145 015044 A     2104 X013   LDA     OREG,1          GET OPERAND REG                     S03 02093
005146 004250 A     2105        LRLA    8               LEFT JUSTIFY BYTE                   S03 02094
005147 004310 A     2106        ASRA    8               EXTEND SIGN                         S03 02095
005150 001000 A     2107        JMP*    X010            RETURN                              S03 02096
005151 105057 R
                    2108 *                                                                  S03 02097
                    2109 *      B=X101  OP1 LEFT BYTE/SIGN EXTENDED                         S03 02098
                    2110 *                                                                  S03 02099
005152 015044 A     2111 X014   LDA     OREG,1          GET OPERAND REG                     S03 02100
005153 001000 A     2112        JMP     X013+2          EXTEND SIGN                         S03 02101
005154 005147 R
                    2113 *                                                                  S03 02102
                    2114 *      B=X110  OP1 RIGHT BYTE                                      S03 02103
                    2115 *                                                                  S03 02104
005155 015044 A     2116 X015   LDA     OREG,1          GET OPERAND REG                     S03 02105
005156 006150 A     2117        ANAI    0377            MASK OUT BYTE                       S03 02106
005157 000377 A
005160 001000 A     2118        JMP*    X010            RETURN                              S03 02107
005161 105057 R
                    2119 *                                                                  S03 02108
005162 000526 R     2120 X019   DATA    R0              ADDR OF PSEUDO REGS                 S03 02109
                    2121        EJEC                                                        S03 02110
                    2122 *                                                                  S03 02111
                    2123 *      FORM ALU OUTPUT                                             S03 02112
                    2124 *                                                                  S03 02113
                    2125 *      CALLING SEQUENCE                                            S03 02114
                    2126 *      LDX     ADDR OF ROM FIELDS/DATA                             S03 02115
                    2127 *      JMPM    X020                                                S03 02116
                    2128 *                                                                  S03 02117
                    2129 *      RETURN  OUTPUT IN A REGISTER                                S03 02118
                    2130 *                                                                  S03 02119
005163 000000 A     2131 X020   ENTR                                                        S03 02120
                    2132 *    ARITHMETIC MODE:(M=0-AND-LB=0OR1)OR(LB=2OR3-AND-F=XX0X        S03 02121
                    2133 *    LOGICAL MODE:(M=1-AND-LB=0OR1)OR(LB=2OR3-AND-F=XX1X           S03 02122
                    2134 *                                                                  S03 02123
005164 015017 A     2135        LDA     XMD,1           ALU FUNCTION MODE IS "LOGICAL" ?    S03 02124
005165 001010 A     2136        JAZ     *+4                                                 S03 02125
005166 005171 R
005167 001000 A     2137        JMP     XAL1            1=YES 0=NO                          S03 02126
005170 005205 R
005171 015013 A     2138        LDA     XLB,1                                               S03 02127
005172 006140 A     2139        SUBI    2               LB=3OR4 ?                           S03 02128
005173 000002 A
005174 001002 A     2140        JAP     *+4             YES-                                S03 02129
005175 005200 R
005176 001000 A     2141        JMP     AR10            NO-GO TO ARITHMETIC MODE            S03 02130
005177 005223 R
005200 015016 A     2142        LDA     XF,1                                                S03 02131
005201 006150 A     2143        ANAI    2               F CODE=XX0X                         S03 02132
005202 000002 A
005203 001010 A     2144        JAZ     AR10            YES-GO TO ARITH. MODE               S03 02133
005204 005223 R
                    2145 *    MD=1                                                          S03 02134
005205 015013 A     2146 XAL1   LDA     XLB,1                                               S03 02135
005206 006140 A     2147        SUBI    2               LB=3OR4 ?                           S03 02136
005207 000002 A
005210 001002 A     2148        JAP     *+4             YES                                 S03 02137
005211 005214 R
005212 001000 A     2149        JMP     X023            GO TO LOGICAL FUNCTIONS             S03 02138
005213 005331 R
005214 015016 A     2150        LDA     XF,1                                                S03 02139
005215 006150 A     2151        ANAI    2               F CODE=XX1X ?                       S03 02140
005216 000002 A
005217 001010 A     2152        JAZ     *+4                                                 S03 02141
005220 005223 R
005221 001000 A     2153        JMP     X023            GO TO LOGICAL FUNCTIONS             S03 02142
005222 005331 R
                    2154 *                                                                  S03 02143
                    2155 *    DETERMINE CARRY IN FOR ARITHMETIC MODE OR SPECIAL ALU MODE    S03 02144
                    2156 *                                                                  S03 02145
005223 015013 A     2157 AR10   LDA     XLB,1           GET LB FIELD                        S03 02146
005224 006140 A     2158        SUBI    02                                                  S03 02147
005225 000002 A
005226 001002 A     2159        JAP     AR12            LB=3 OR 4                           S03 02148
005227 005257 R
005230 002000 A     2160        CALL    SALU            DETERMINE IF SPECIAL ALU MODE       S03 02149
005231 004352 R
005232 001000 A     2161        JMP     AR20            YES-                                S03 02150
005233 005267 R
005234 025020 A     2162        LDB     XC,1            CARRY CONTROL                       S03 02151
005235 005001 A     2163        TZA                                                         S03 02152
005236 001020 A     2164        JBZ     X026            JUMP IF ZERO CARRY IN               S03 02153
005237 005254 R
005240 015036 A     2165        LDA     CARRY,1         STORED CARRY                        S03 02154
005241 005322 A     2166        DBR                                                         S03 02155
005242 001020 A     2167        JBZ     X026            JUMP IF USE STORED CARRY            S03 02156
005243 005254 R
005244 005211 A     2168        COMPL   011             COMPLEMENT CARRY                    S03 02157
005245 006150 A     2169        ANAI    01              USE COMPLEMENTED CARRY              S03 02158
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005246 000001 A                                                                                    S03 02159
005247 005322 A 2170          DBR                                                                  E.2********
005250 065035 A 2171          STB     XCIN,1          CLEAR CIN IF NOT TO BE SET                   E.2********
005251 001020 A 2172          JBZ     X026+1
005252 005255 R
005253 005101 A 2173          INCR    01              XCIN=1                                       S03 02161
005254 055035 A 2174 X026     STA     XCIN,1          CARRY IN FOR OPERATION                       S03 02162
005255 001000 A 2175          JMP     AR13                                                         S03 02163
005256 005301 R
005257 015016 A 2176 AR12     LDA     XF,1                                                         S03 02164
005260 006150 A 2177          ANAI    2                                                            S03 02165
005261 000002 A
005262 001010 A 2178          JAZ     X026                                                         S03 02166
005263 005254 R
005264 004341 A 2179          LSRA    1                                                            S03 02167
005265 001000 A 2180          JMP     X026                                                         S03 02168
005266 005254 R
               2181 *                                                                              S03 02169
               2182 *    IF IRG2 BITS 7&6=01: SET CARRY-IN                                         S03 02170
               2183 *    IF IRG2 BITS 7&6=00,10,11: RESET CARRY-IN                                 S03 02171
005267 015052 A 2184 AR20     LDA     IRG2,1          NO RETURN POINT FROM SALU                    S03 02172
005270 006150 A 2185          ANAI    0300                                                         S03 02173
005271 000300 A
005272 004346 A 2186          LSRA    6                                                            S03 02174
005273 005311 A 2187          DAR                                                                  S03 02175
005274 001010 A 2188          JAZ     X026-1          GO SET CARRY-IN                              S03 02176
005275 005253 R
005276 005001 A 2189          TZA                                                                  S03 02177
005277 001000 A 2190          JMP     X026            GO RESET CARRY-IN                            S03 02178
005300 005254 R
               2191 *                                                                              S03 02179
               2192 *    DO ARITHMETIC OPERATION                                                   S03 02180
               2193 *                                                                              S03 02181
005301 015016 A 2194 AR13     LDA     XF,1            ADDER FUNCTION                               S03 02182
005302 124005 A 2195          ADD     X022            LOOP UP LIST                                 S03 02183
005303 005012 A 2196          TAB                                                                  S03 02184
005304 016000 A 2197          LDA     0,2             ADDR OF FUNCTION ROUTINE                     S03 02185
005305 054001 A 2198          STA     X021            SAVE FOR JUMP                                S03 02186
005306 001000 A 2199          JMP     *               DO FUNCTION REQUESTED                        S03 02187
005307 005306 R
005307         2200 X021      BES     0               SAVED JUMP ADDRESS                           S03 02188
               2201 *                                                                              S03 02189
005310 005311 R 2202 X022     DATA    *+1             ARITHMETIC FUNCTIONS                         S03 02190
005311 005456 R 2203          DATA    X062            0000 ADD A AND CIN                           S03 02191
005312 005472 R 2204          DATA    X064            0001 OR A AND B, ADD CIN                     S03 02192
005313 005476 R 2205          DATA    X066            0010 COMPLEMENT B, OR WITH A,                S03 02193
               2206 *                                      ADD CIN                                S03 02194
005314 005503 R 2207          DATA    X068            0011 GENERATE ALL ONES, ADD CIN              S03 02195
005315 005506 R 2208          DATA    X070            0100 COMPLEMENT B, AND WITH A,               S03 02196
               2209 *                                      ADD A, ADD CIN                         S03 02197
005316 005530 R 2210          DATA    X072            0101 OR A AND B,                             S03 02198
               2211 *                                      COMPLEMENT B, AND WITH A,              S03 02199
               2212 *                                      ADD RESULT, ADD CIN                    S03 02200
005317 005545 R 2213          DATA    X074            0110 ADD A AND CIN, SUBTRACT B               S03 02201
               2214 *                                      SUBTRACT 1                             S03 02202
005320 005603 R 2215          DATA    X076            0111 COMPLEMENT B, AND WITH A,               S03 02203
               2216 *                                      SUBTRACT 1, ADD CIN                    S03 02204
005321 005617 R 2217          DATA    X078            1000 AND A AND B, ADD A, ADD CIN             S03 02205
005322 005631 R 2218          DATA    X080            1001 ADD A AND B, ADD CIN                    S03 02206
005323 005643 R 2219          DATA    X082            1010 COMPLEMENT B, OR WITH A                 S03 02207
               2220 *                                      AND A AND B,                           S03 02208
               2221 *                                      ADD RESULT, ADD CIN                    S03 02209
005324 005660 R 2222          DATA    X084            1011 AND A AND B, SUBTRACT 1, ADD CIN        S03 02210
005325 005701 R 2223          DATA    X086            1100 ADD A AND A, ADD CIN                    S03 02211
005326 005713 R 2224          DATA    X088            1101 OR A AND B, ADD A, ADD CIN              S03 02212
005327 005724 R 2225          DATA    X090            1110 COMPLEMENT B, OR WITH A,                S03 02213
               2226 *                                      ADD A, ADD CIN                         S03 02214
005330 005733 R 2227          DATA    X092            1111 ADD A, ADD CIN, SUBTRACT 1              S03 02215
               2228          EJEC,                                                                S03 02216
               2229 *                                                                             S03 02217
               2230 *    DO LOGICAL FUNCTION                                                      S03 02218
               2231 *                                                                             S03 02219
005331 015016 A 2232 X023     LDA     XF,1            ADDER FUNCTION                               S03 02220
005332 124005 A 2233          ADD     X025            LOOK UP LIST                                 S03 02221
005333 005012 A 2234          TAB                                                                  S03 02222
005334 016000 A 2235          LDA     0,2             ADDR OF FUNCTION ROUTINE                     S03 02223
005335 054001 A 2236          STA     X024            SAVE FOR JUMP                                S03 02224
005336 001000 A 2237          JMP     *               DO FUNCTION                                  S03 02225
005337 005336 R
005337         2238 X024      BES     0               JUMP ADDRESS                                 S03 02226
               2239 *                                                                             S03 02227
005340 005341 R 2240 X025     DATA    *+1             LOGICAL FUNCTIONS                            S03 02228
005341 005361 R 2241          DATA    X030            0000 COMPLEMENT A                            S03 02229
005342 005365 R 2242          DATA    X032            0001 OR A AND B, COMPLEMENT                  S03 02230
005343 005371 R 2243          DATA    X034            0010 COMPLEMENT A, AND WITH B                S03 02231
005344 005376 R 2244          DATA    X036            0011 GENERATE ALL ZEROS                      S03 02232
005345 005401 R 2245          DATA    X038            0100 AND A AND B, COMPLEMENT                 S03 02233
005346 005405 R 2246          DATA    X040            0101 COMPLEMENT B                            S03 02234
005347 005410 R 2247          DATA    X042            0110 EXCLUSIVE OR A AND B                    S03 02235
005350 005414 R 2248          DATA    X044            0111 COMPLEMENT B, AND WITH A                S03 02236
005351 005421 R 2249          DATA    X046            1000 COMPLEMENT A, OR WITH B                 S03 02237
005352 005426 R 2250          DATA    X048            1001 EXCLUSIVE OR A AND B, COMPLEMENT        S03 02238
005353 005432 R 2251          DATA    X050            1010 B                                       S03 02239
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005354 005435 R 2252          DATA    X052        1011 AND A AND B                    $03 02240
005355 005440 R 2253          DATA    X054        1100 GENERATE ALL ONES              $03 02241
005356 005443 R 2254          DATA    X056        1101 COMPLEMENT B, OR WITH A        $03 02242
005357 005450 R 2255          DATA    X058        1110 OR A AND B                     $03 02243
005360 005453 R 2256          DATA    X060        1111 A                              $03 02244
                2257 *                                                                $03 02245
                2258 *                                                                $03 02246
                2259 *                                                                $03 02247
                2260 *                                                                $03 02248
                2261 *                                                                $03 02249
                2262 *        NOTE - IN THE FOLLOWING ROUTINES A REFERS TO THE LATCH A $03 02250
                2263 *        INPUT TO THE ALU AND B REFERS TO THE LATCH B INPUT      $03 02251
                2264 *                                                                $03 02252
                2265 *                                                                $03 02253
                2266 *                                                                $03 02254
                2267 *                                                                $03 02255
                2268 *                                                                $03 02256
                2269 *        COMPLEMENT A            (0000)                          $03 02257
                2270 *                                                                $03 02258
005361 015032 A 2271 X030     LDA     LTCHA,1     A                                   $03 02259
005362 005211 A 2272          COMPL   011         COMPLEMENT                          $03 02260
005363 001000 A 2273          JMP*    X020        RETURN                              $03 02261
005364 105163 R
                2274 *                                                                $03 02262
                2275 *        OR A AND B, COMPLEMENT  (0001)                          $03 02263
                2276 *                                                                $03 02264
005365 015032 A 2277 X032     LDA     LTCHA,1     A                                   $03 02265
005366 115033 A 2278          ORA     LTCHB,1     OR WITH B                           $03 02266
005367 001000 A 2279          JMP     X030+1      COMPLEMENT                          $03 02267
005370 005362 R
                2280 *                                                                $03 02268
                2281 *        COMPLEMENT A, AND WITH B  (0010)                        $03 02269
                2282 *                                                                $03 02270
005371 015032 A 2283 X034     LDA     LTCHA,1     A                                   $03 02271
005372 005211 A 2284          COMPL   011         COMPLEMENT                          $03 02272
005373 155033 A 2285          ANA     LTCHB,1     AND WITH B                          $03 02273
005374 001000 A 2286          JMP*    X020        RETURN                              $03 02274
005375 105163 R
                2287 *                                                                $03 02275
                2288 *        GENERATE ALL ZEROS      (0011)                          $03 02276
                2289 *                                                                $03 02277
005376 005001 A 2290 X036     TZA                                                     $03 02278
005377 001000 A 2291          JMP*    X020        RETURN                              $03 02279
005400 105163 R
                2292 *                                                                $03 02280
                2293 *        AND A AND B, COMPLEMENT  (0100)                         $03 02281
                2294 *                                                                $03 02282
005401 015032 A 2295 X038     LDA     LTCHA,1     A                                   $03 02283
005402 155033 A 2296          ANA     LTCHB,1     AND WITH B                          $03 02284
005403 001000 A 2297          JMP     X030+1      COMPLEMENT                          $03 02285
005404 005362 R
                2298 *                                                                $03 02286
                2299 *        COMPLEMENT B            (0101)                          $03 02287
                2300 *                                                                $03 02288
005405 015033 A 2301 X040     LDA     LTCHB,1     B                                   $03 02289
005406 001000 A 2302          JMP     X030+1      COMPLEMENT                          $03 02290
005407 005362 R
                2303 *                                                                $03 02291
                2304 *        EXCLUSIVE OR A AND B    (0110)                          $03 02292
                2305 *                                                                $03 02293
005410 015032 A 2306 X042     LDA     LTCHA,1     A                                   $03 02294
005411 135033 A 2307          ERA     LTCHB,1     EXCLUSIVE OR WITH B                 $03 02295
005412 001000 A 2308          JMP*    X020        RETURN                              $03 02296
005413 105163 R
                2309 *                                                                $03 02297
                2310 *        COMPLEMENT B, AND WITH A  (0111)                        $03 02298
                2311 *                                                                $03 02299
005414 015033 A 2312 X044     LDA     LTCHB,1     B                                   $03 02300
005415 005211 A 2313          COMPL   011         COMPLEMENT                          $03 02301
005416 155032 A 2314          ANA     LTCHA,1     AND WITH A                          $03 02302
005417 001000 A 2315          JMP*    X020        RETURN                              $03 02303
005420 105163 R
                2316 *                                                                $03 02304
                2317 *        COMPLEMENT A, OR WITH B  (1000)                         $03 02305
                2318 *                                                                $03 02306
005421 015032 A 2319 X046     LDA     LTCHA,1     A                                   $03 02307
005422 005211 A 2320          COMPL   011         COMPLEMENT                          $03 02308
005423 115033 A 2321          ORA     LTCHB,1     OR WITH B                           $03 02309
005424 001000 A 2322          JMP*    X020        RETURN                              $03 02310
005425 105163 R
                2323 *                                                                $03 02311
                2324 *        EXCLUSIVE OR A AND B, COMPLEMENT  (1001)                $03 02312
                2325 *                                                                $03 02313
005426 015032 A 2326 X048     LDA     LTCHA,1     A                                   $03 02314
005427 135033 A 2327          ERA     LTCHB,1     EXCLUSIVE OR WITH B                 $03 02315
005430 001000 A 2328          JMP     X030+1      COMPLEMENT                          $03 02316
005431 005362 R
                2329 *                                                                $03 02317
                2330 *        B                       (1010)                          $03 02318
                2331 *                                                                $03 02319
005432 015033 A 2332 X050     LDA     LTCHB,1     B                                   $03 02320
005433 001000 A 2333          JMP*    X020        RETURN                              $03 02321
005434 105163 R
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                    2334 *                                                                  S03 02322
                    2335 *      AND A AND B                 (1011)                      S03 02323
                    2336 *                                                                  S03 02324
005435 015032 A     2337 X052   LDA     LTCHA,1             A                           S03 02325
005436 001000 A     2338        JMP     X034+2              AND WITH B                  S03 02326
005437 005373 R
                    2339 *                                                                  S03 02327
                    2340 *      GENERATE ALL ONES           (1100)                      S03 02328
                    2341 *                                                                  S03 02329
005440 005301 A     2342 X054   DECR    01                  ALL ONES                    S03 02330
005441 001000 A     2343        JMP*    X020                RETURN                      S03 02331
005442 105163 R
                    2344 *                                                                  S03 02332
                    2345 *      COMPLEMENT B, OR WITH A  (1101)                         S03 02333
                    2346 *                                                                  S03 02334
005443 015033 A     2347 X056   LDA     LTCHB,1             B                           S03 02335
005444 005211 A     2348        COMPL   011                 COMPLEMENT                  S03 02336
005445 115032 A     2349        ORA     LTCHA,1             OR WITH A                   S03 02337
005446 001000 A     2350        JMP*    X020                RETURN                      S03 02338
005447 105163 R
                    2351 *                                                                  S03 02339
                    2352 *      OR A AND B                  (1110)                      S03 02340
                    2353 *                                                                  S03 02341
005450 015033 A     2354 X058   LDA     LTCHB,1             B                           S03 02342
005451 001000 A     2355        JMP     X056+2              OR WITH A                   S03 02343
005452 005445 R
                    2356 *                                                                  S03 02344
                    2357 *      A                           (1111)                      S03 02345
                    2358 *                                                                  S03 02346
005453 015032 A     2359 X060   LDA     LTCHA,1             A                           S03 02347
005454 001000 A     2360        JMP*    X020                RETURN                      S03 02348
005455 105163 R
                    2361        EJEC                                                    S03 02349
                    2362 *                                                                  S03 02350
                    2363 *      0000    ADD A AND CIN                                   S03 02351
                    2364 *                                                                  S03 02352
005456 015032 A     2365 X062   LDA     LTCHA,1             A                           S03 02353
005457 125035 A     2366 X063   ADD     XCIN,1              ADD CIN                     S03 02354
005460 002000 A     2367        JMPM    X094                SAVE OVERFLOW               S03 02355
005461 005752 R
005462 015035 A     2368        LDA     XCIN,1              CIN                         S03 02356
005463 001010 A     2369        JAZ     X095                NO CARRY OUT IF NO CARRY IN S03 02357
005464 005762 R
005465 014337 A     2370        LDA     X099                ALU RESULT                  S03 02358
005466 001010 A     2371        JAZ     X097                SET CARRY ON ZERO RESULT    S03 02359
005467 005771 R
005470 001000 A     2372        JMP     X095                NO CARRY OUT                S03 02360
005471 005762 R
                    2373 *                                                                  S03 02361
                    2374 *      0001    OR A AND B, ADD CIN                             S03 02362
                    2375 *                                                                  S03 02363
005472 015032 A     2376 X064   LDA     LTCHA,1             A                           S03 02364
005473 115033 A     2377        ORA     LTCHB,1             OR WITH B                   S03 02365
005474 001000 A     2378        JMP     X063                ADD CIN                     S03 02366
005475 005457 R
                    2379 *                                                                  S03 02367
                    2380 *      0010    COMPLEMENT B, OR WITH A, ADD CIN                S03 02368
                    2381 *                                                                  S03 02369
005476 015033 A     2382 X066   LDA     LTCHB,1             B                           S03 02370
005477 005211 A     2383        COMPL   011                 COMPLEMENT                  S03 02371
005500 115032 A     2384        ORA     LTCHA,1             OR WITH A                   S03 02372
005501 001000 A     2385        JMP     X063                ADD CIN                     S03 02373
005502 005457 R
                    2386 *                                                                  S03 02374
                    2387 *      0011    GENERATE ALL ONES, ADD CIN                      S03 02375
                    2388 *                                                                  S03 02376
005503 005301 A     2389 X068   DECR    01                  ALL ONES                    S03 02377
005504 001000 A     2390        JMP     X063                ADD CIN                     S03 02378
005505 005457 R
                    2391 *                                                                  S03 02379
                    2392 *      0100    COMPLEMENT B, AND WITH A, ADD A, ADD CIN        S03 02380
                    2393 *                                                                  S03 02381
005506 015033 A     2394 X070   LDA     LTCHB,1             B                           S03 02382
005507 005211 A     2395        COMPL   011                 COMPLEMENT                  S03 02383
005510 155032 A     2396        ANA     LTCHA,1             AND WITH A                  S03 02384
005511 054344 A     2397        STA     X0AB                SECOND RESULT               S03 02385
005512 125032 A     2398        ADD     LTCHA,1             ADD A                       S03 02386
005513 125035 A     2399        ADD     XCIN,1              ADD CIN                     S03 02387
005514 002000 A     2400        JMPM    X094                SAVE OVERFLOW               S03 02388
005515 005752 R
005516 015032 A     2401        LDA     LTCHA,1             A                           S03 02389
005517 054335 A     2402        STA     X0AA                FIRST RESULT                S03 02390
                    2403 *                                                                  S03 02391
005520 015035 A     2404 X071   LDA     XCIN,1              CIN                         S03 02392
005521 001010 A     2405        JAZ     X0A0                DO CARRY CALCULATION        S03 02393
005522 006026 R
005523 014301 A     2406        LDA     X099                ALU RESULT                  S03 02394
005524 001010 A     2407        JAZ     X097                SET CARRY ON ZERO RESULT    S03 02395
005525 005771 R
005526 001000 A     2408        JMP     X0A0                DO CARRY CALCULATION        S03 02396
005527 006026 R
                    2409 *                                                                  S03 02397
                    2410 *      0101    ADD (OR A AND B) WITH (COMPLEMENT B, AND WITH A),   S03 02398
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                    2411 *                ADD CIN                                                    $03 02399
                    2412 *                                                                           $03 02400
005530 015032 A     2413 X072     LDA     LTCHA,1       A                                            $03 02401
005531 115033 A     2414          ORA     LTCHB,1       OR WITH B                                    $03 02402
005532 054322 A     2415          STA     X0AA          FIRST RESULT                                 $03 02403
005533 015033 A     2416          LDA     LTCHB,1       B                                            $03 02404
005534 005211 A     2417          COMPL   011           COMPLEMENT                                   $03 02405
005535 155032 A     2418          ANA     LTCHA,1       AND WITH A                                   $03 02406
005536 054317 A     2419          STA     X0AB          SECOND RESULT                                $03 02407
005537 124315 A     2420          ADD     X0AA          ADD FIRST RESULT                             $03 02408
005540 125035 A     2421          ADD     XCIN,1        ADD CIN                                      $03 02409
005541 002000 A     2422          JMPM    X094          SAVE OVERFLOW                                $03 02410
005542 005752 R
005543 001000 A     2423          JMP     X071          DO CARRY CALCULATION                         $03 02411
005544 005520 R
                    2424 *                                                                           $03 02412
                    2425 *        0110    ADD A AND CIN, SUBTRACT B, SUBTRACT 1                      $03 02413
                    2426 *                                                                           $03 02414
005545 015032 A     2427 X074     LDA     LTCHA,1       A                                            $03 02415
005546 145033 A     2428          SUB     LTCHB,1       SUBTRACT B                                   $03 02416
005547 005311 A     2429          DAR                   SUBTRACT 1                                   $03 02417
005550 125035 A     2430          ADD     XCIN,1        ADD CIN                                      $03 02418
005551 002000 A     2431          JMPM    X094          SAVE OVERFLOW                                $03 02419
005552 005752 R
005553 015035 A     2432          LDA     XCIN,1        CIN                                          $03 02420
005554 001010 A     2433          JAZ     X075          JUMP IF NO CARRY IN                          $03 02421
005555 005575 R
                    2434 *                                                                           $03 02422
005556 015032 A     2435          LDA     LTCHA,1       A                                            $03 02423
005557 135033 A     2436          ERA     LTCHB,1       B                                            $03 02424
005560 001002 A     2437          JAP     *+7           JUMP IF SIGNS THE SAME                       $03 02425
005561 005567 R
005562 015032 A     2438          LDA     LTCHA,1       A                                            $03 02426
005563 001004 A     2439          JAN     X097          SET CARRY IF A NEGATIVE                      $03 02427
005564 005771 R
005565 001000 A     2440          JMP     X096          NO CARRY                                     $03 02428
005566 005762 R
                    2441 *                                                                           $03 02429
005567 015032 A     2442          LDA     LTCHA,1       A                                            $03 02430
005570 145033 A     2443          SUB     LTCHB,1       LESS B                                       $03 02431
005571 001002 A     2444          JAP     X097          SET CARRY IF A GREATER                       $03 02432
005572 005771 R
005573 001000 A     2445          JMP     X096          NO CARRY                                     $03 02433
005574 005762 R
                    2446 *                                                                           $03 02434
005575 014227 A     2447 X075     LDA     X099          RESULT                                       $03 02435
005576 005211 A     2448          CPA                                                                $03 02436
005577 001010 A     2449          JAZ     X096          NO CARRY ON -1 RESULT                        $03 02437
005600 005762 R
005601 001000 A     2450          JMP     X097          SET CARRY                                    $03 02438
005602 005771 R
                    2451 *                                                                           $03 02439
                    2452 *        0111    COMPLEMENT B, AND WITH A, SUBTRACT 1, ADD CIN              $03 02440
                    2453 *                                                                           $03 02441
005603 015033 A     2454 X076     LDA     LTCHB,1       B                                            $03 02442
005604 005211 A     2455          COMPL   011           COMPLEMENT                                   $03 02443
005605 155032 A     2456          ANA     LTCHA,1       AND WITH A                                   $03 02444
005606 005311 A     2457          DAR                   SUBTRACT 1                                   $03 02445
005607 125035 A     2458          ADD     XCIN,1        ADD CIN                                      $03 02446
005610 002000 A     2459          JMPM    X094          SAVE OVERFLOW                                $03 02447
005611 005752 R
005612 015035 A     2460          LDA     XCIN,1        CIN                                          $03 02448
005613 001010 A     2461          JAZ     X075          JUMP IF NO CARRY IN                          $03 02449
005614 005575 R
005615 001000 A     2462          JMP     X096          NO CARRY OUT                                 $03 02450
005616 005762 R
                    2463 *                                                                           $03 02451
                    2464 *        1000    AND A AND B, ADD A, ADD CIN                                $03 02452
                    2465 *                                                                           $03 02453
005617 015032 A     2466 X078     LDA     LTCHA,1       A                                            $03 02454
005620 054234 A     2467          STA     X0AA          FIRST RESULT                                 $03 02455
005621 155033 A     2468          ANA     LTCHB,1       AND WITH B                                   $03 02456
005622 054233 A     2469          STA     X0AB          SECOND RESULT                                $03 02457
005623 125032 A     2470          ADD     LTCHA,1       ADD A                                        $03 02458
005624 125035 A     2471          ADD     XCIN,1        ADD CIN                                      $03 02459
005625 002000 A     2472          JMPM    X094          SAVE OVERFLOW                                $03 02460
005626 005752 R
005627 001000 A     2473          JMP     X071          DO CARRY CALCULATION                         $03 02461
005630 005520 R
                    2474 *                                                                           $03 02462
                    2475 *        1001    ADD A AND B, ADD CIN                                       $03 02463
                    2476 *                                                                           $03 02464
005631 015032 A     2477 X080     LDA     LTCHA,1       A                                            $03 02465
005632 054222 A     2478          STA     X0AA          FIRST RESULT                                 $03 02466
005633 125033 A     2479          ADD     LTCHB,1       ADD B                                        $03 02467
005634 125035 A     2480          ADD     XCIN,1        ADD CIN                                      $03 02468
005635 002000 A     2481          JMPM    X094          SAVE OVERFLOW                                $03 02469
005636 005752 R
005637 015033 A     2482          LDA     LTCHB,1       B                                            $03 02470
005640 054215 A     2483          STA     X0AB          SECOND RESULT                                $03 02471
005641 001000 A     2484          JMP     X071          DO CARRY CALCULATION                         $03 02472
005642 005520 R
                    2485 *                                                                           $03 02473
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                    2486 *          1010    ADD (COMPLEMENT B, OR WITH A) WITH (AND A AND B),          S03 02474
                    2487 *                  ADD CIN                                                    S03 02475
                    2488 *                                                                             S03 02476
005643 015033 A     2489 X082       LDA     LTCHB,1         B                                          S03 02477
005644 005211 A     2490            COMPL   011             COMPLEMENT                                 S03 02478
005645 115032 A     2491            ORA     LTCHA,1         OR WITH A                                  S03 02479
005646 054206 A     2492            STA     X0AA            FIRST RESULT                               S03 02480
005647 015032 A     2493            LDA     LTCHA,1         A                                          S03 02481
005650 155033 A     2494            ANA     LTCHB,1         AND WITH B                                 S03 02482
005651 054204 A     2495            STA     X0AB            SECOND RESULT                              S03 02483
005652 124202 A     2496            ADD     X0AA            ADD FIRST RESULT                           S03 02484
005653 125035 A     2497            ADD     XCIN,1          ADD CIN                                    S03 02485
005654 002000 A     2498            JMPM    X094            SAVE OVERFLOW                              S03 02486
005655 005752 R
005656 001000 A     2499            JMP     X071            DO CARRY CALCULATION                       S03 02487
005657 005520 R
                    2500 *                                                                             S03 02488
                    2501 *          1011    AND A AND B, SUBTRACT 1, ADD CIN                           S03 02489
                    2502 *                                                                             S03 02490
005660 015032 A     2503 X084       LDA     LTCHA,1         A                                          S03 02491
005661 155033 A     2504            ANA     LTCHB,1         AND WITH B                                 S03 02492
005662 005311 A     2505            DAR                     SUBTRACT 1                                 S03 02493
005663 125035 A     2506            ADD     XCIN,1          ADD CIN                                    S03 02494
005664 002000 A     2507            JMPM    X094            SAVE OVERFLOW                              S03 02495
005665 005752 R
005666 015035 A     2508            LDA     XCIN,1          CIN                                        S03 02496
005667 001010 A     2509            JAZ     *+4             JUMP IF NO CARRY IN                        S03 02497
005670 005673 R
005671 001000 A     2510            JMP     X096            NO CARRY OUT                               S03 02498
005672 005762 R
005673 014131 A     2511            LDA     X099            ALU RESULT                                 S03 02499
005674 005211 A     2512            CPA                     COMPLEMENT                                 S03 02500
005675 001010 A     2513            JAZ     X096            NO CARRY OUT ON -1 RESULT                  S03 02501
005676 005762 R
005677 001000 A     2514            JMP     X097            SET CARRY OUT                              S03 02502
005700 005771 R
                    2515 *                                                                             S03 02503
                    2516 *          1100    ADD A AND A, ADD CIN                                       S03 02504
                    2517 *                                                                             S03 02505
005701 015032 A     2518 X086       LDA     LTCHA,1         A                                          S03 02506
005702 125032 A     2519            ADD     LTCHA,1         ADD A                                      S03 02507
005703 125035 A     2520            ADD     XCIN,1          ADD CIN                                    S03 02508
005704 002000 A     2521            JMPM    X094            SAVE OVERFLOW                              S03 02509
005705 005752 R
005706 015032 A     2522            LDA     LTCHA,1         A                                          S03 02510
005707 001004 A     2523            JAN     X097            SET CARRY IF A NEGATIVE                    S03 02511
005710 005771 R
005711 001000 A     2524            JMP     X096            NO CARRY OUT                               S03 02512
005712 005762 R
                    2525 *                                                                             S03 02513
                    2526 *          1101    OR A AND B, ADD A, ADD CIN                                 S03 02514
                    2527 *                                                                             S03 02515
005713 015032 A     2528 X088       LDA     LTCHA,1         A                                          S03 02516
005714 115033 A     2529            ORA     LTCHB,1         OR WITH B                                  S03 02517
005715 054140 A     2530            STA     X0AB            SECOND RESULT                              S03 02518
005716 125032 A     2531            ADD     LTCHA,1         ADD A                                      S03 02519
                    2532 *                                                                             S03 02520
005717 125035 A     2533 X089       ADD     XCIN,1          ADD CIN                                    S03 02521
005720 002000 A     2534            JMPM    X094            SAVE OVERFLOW                              S03 02522
005721 005752 R
005722 001000 A     2535            JMP     X071-2          DO CARRY CALCULATION                       S03 02523
005723 005516 R
                    2536 *                                                                             S03 02524
                    2537 *          1110    COMPLEMENT B, OR WITH A, ADD A, ADD CIN                    S03 02525
                    2538 *                                                                             S03 02526
005724 015032 A     2539 X090       LDA     LTCHB,1         B                                          S03 02527
005725 005211 A     2540            COMPL   011             COMPLEMENT                                 S03 02528
005726 115032 A     2541            ORA     LTCHA,1         OR WITH A                                  S03 02529
005727 054126 A     2542            STA     X0AB            SECOND RESULT                              S03 02530
005730 125032 A     2543            ADD     LTCHA,1         ADD A                                      S03 02531
005731 001000 A     2544            JMP     X089            DO CARRY CALCULATION                       S03 02532
005732 005717 R
                    2545 *                                                                             S03 02533
                    2546 *          1111    ADD A AND CIN, SUBTRACT 1                                  S03 02534
                    2547 *                                                                             S03 02535
005733 015032 A     2548 X092       LDA     LTCHA,1         A                                          S03 02536
005734 005311 A     2549            DAR                     SUBTRACT 1                                 S03 02537
005735 125035 A     2550            ADD     XCIN,1          ADD CIN                                    S03 02538
005736 002000 A     2551            JMPM    X094            SAVE OVERFLOW                              S03 02539
005737 005752 R
005740 015035 A     2552            LDA     XCIN,1          CIN                                        S03 02540
005741 001010 A     2553            JAZ     *+4             JUMP IF NO CARRY IN                        S03 02541
005742 005745 R
005743 001000 A     2554            JMP     X096            NO CARRY OUT                               S03 02542
005744 005762 R
005745 015032 A     2555            LDA     LTCHA,1         A                                          S03 02543
005746 001010 A     2556            JAZ     X096            NO CARRY OUT IF A ZERO                     S03 02544
005747 005762 R
005750 001000 A     2557            JMP     X097            SET CARRY OUT                              S03 02545
005751 005771 R
                    2558 *                                                                             S03 02546
                    2559            EJEC                                                               S03 02547
                    2560 *                                                                             S03 02548
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                    2561 *       SAVE OVERFLOW FROM ARITHMETIC OPERATION                                  S03 02549
                    2562 *                                                                                S03 02550
005752 000000 A     2563 X094    ENTR                                                                     S03 02551
005753 054051 A     2564         STA     X099            SAVE RESULT ...                                  S03 02552
005754 005001 A     2565         TZA                                                                      S03 02553
005755 005511 A     2566         AOFA                    PUT OVERFLOW IN A                                S03 02554
005756 055037 A     2567         STA     OVRFL,1         SAVE OVERFLOW                                    S03 02555
005757 014045 A     2568         LDA     X099            GET RESULT                                       S03 02556
005760 001000 A     2569         JMP*    X094            RETURN                                           S03 02557
005761 105752 R
                    2570 *                                                                                S03 02558
                    2571 *       SET ZERO CARRY                                                           S03 02559
                    2572 *                                                                                S03 02560
       005762 R     2573 X096    EQU     *                                                               E.2*********
005762 002000 A     2574 X095    JMPM    X09A            CHECK IF SAMPLING                                 C 03 02561
005763 005777 R
005764 005001 A.    2575         TZA                                                                       C 03 02562
005765 055036 A     2576         STA     CARRY,1         SET CARRY                                          S03 02563
005766 014036 A     2577 X096A   LDA     X099            ALU RESULT                                      E.2*********
005767 001000 A     2578         JMP*    X020            RETURN                                             S03 02565
005770 105163 R
                    2579 *                                                                                S03 02566
                    2580 *       SET CARRY OF ONE                                                         S03 02567
                    2581 *                                                                                S03 02568
005771 002000 A     2582 X097    JMPM    X09A            CHECK IF SAMPLING                                 C 03 02569
005772 005777 R
005773 005101 A     2583         INCR    01                                                                C 03 02570
005774 055036 A     2584         STA     CARRY,1         SET CARRY                                          S03 02571
005775 001000 A     2585         JMP     X096A           GET ALU RESULT AND EX                           E.2*********
005776 005766 R
                    2586 *                                                                                C 03 02573
                    2587 *       SUBROUTINE TO CHECK IF SAMPLING  (S=0,T=0, AND G=XX1X)                   C 03 02574
                    2588 *             RETURN INCR BY TWO IF NOT SAMPLING                                 C 03 02575
                    2589 *                                                                                C 03 02576
005777 000000 A     2590 X09A    ENTR                                                                      C 03 02577
006000 015006 A     2591         LDA     XS,1            S FIELD                                           C 03 02578
006001 115005 A     2592         ORA     XT,1            T FIELD                                           C 03 02579
006002 001010 A     2593         JAZ     X09C            IF S=0 + T=0                                      C 03 02580
006003 006016 R
006004 015006 A     2594         LDA     XS,1                                                           FF  ********
006005 006140 A     2595         SUBI    2                                                              FF  ********
006006 000002 A
006007 115005 A     2596         ORA     XT,1                                                           FF  ********
006010 001010 A     2597         JAZ     X09C            IF SF=2 AND TF=0                               FF  ********
006011 006016 R
006012 047000 I     2598 X09B    INR     X09A            ADVANCE                                           C 03 02581
006013 047000 I     2599         INR     X09A            RETURN                                            C 03 02582
006014 001000 A     2600         JMP*    X09A            ADDRESS                                           C 03 02583
006015 105777 R
006016 015007 A     2601 X09C    LDA     XG,1            G FIELD                                           C 03 02584
006017 006150 A     2602         ANAI    02              BIT 1                                             C 03 02585
006020 000002 A
006021 001010 A     2603         JAZ     X09B            JUMP IF NOT SET                                   C 03 02586
006022 006012 R
006023 001000 A     2604         JMP*    X09A            SAMPLING                                          C 03 02587
006024 105777 R
                    2605 *                                                                                S03 02588
006025 000000 A     2606 X099    DATA    0               TEMP STORAGE                                      S03 02589
                    2607 *                                                                                S03 02590
                    2608 *                                                                                S03 02591
                    2609 *                                                                                S03 02592
                    2610 *       CARRY CALCULATION ROUTINE                                                S03 02593
                    2611 *                                                                                S03 02594
006026 014026 A     2612 X0A0    LDA     X0AA            FIRST RESULT                                     S03 02595
006027 154026 A     2613         ANA     X0AB            SECOND RESULT                                    S03 02596
006030 001004 A     2614         JAN     X097            SET CARRY IF BOTH NEGATIVE                       S03 02597
006031 005771 R
006032 014022 A     2615         LDA     X0AA            FIRST RESULT                                     S03 02598
006033 001004 A     2616         JAN     X0A1            JUMP IF NEGATIVE                                 S03 02599
006034 006045 R
006035 014020 A     2617         LDA     X0AB            SECOND RESULT                                    S03 02600
006036 001002 A     2618         JAP     X095            NO CARRY IF RESULT POSITIVE                 D     03 02601
006037 005762 R
006040 124014 A     2619         ADD     X0AA            PLUS FIRST RESULT                                S03 02602
006041 001002 A     2620         JAP     X097            SET CARRY IF FIRST RESULT LARGER                 S03 02603
006042 005771 R
006043 001000 A     2621         JMP     X095            NO CARRY                                    D     03 02604
006044 005762 R
                    2622 *                                                                                S03 02605
                    2623 *                                                                                S03 02606
006045 014010 A     2624 X0A1    LDA     X0AB            SECOND RESULT                                    S03 02607
006046 001004 A     2625         JAN     X095            NO CARRY IF RESULT POSITIVE                      S03 02608
006047 005762 R
006050 124004 A     2626         ADD     X0AA            PLUS FIRST RESULT                                S03 02609
006051 001004 A     2627         JAN     X095            NO CARRY IF FIRST RESULT LARGER                  S03 02610
006052 005762 R
006053 001000 A     2628         JMP     X097            SET CARRY                                        S03 02611
006054 005771 R
                    2629 *                                                                                S03 02612
006055 000000 A     2630 X0AA    DATA    0               FIRST RESULT                                     S03 02613
006056 000000 A     2631 X0AB    DATA    0               SECOND RESULT                                    S03 02614
                    2632         EJEC                                                                     S03 02615
                    2633 *                                                                                S03 02616
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                    2634 *    DETERMINE STATE OF MULTIPLY SIGN(MULS).                                    S03 02617
                    2635 *       MULS=(LA15-AND-LB15)-OR-(LB15-AND-AL15)-OR-(LA15-AND-AL15)              S03 02618
                    2636 *                                                                                 S03 02619
000057 000000 A     2637 DLMS    ENTR                                                                      S03 02620
006060 015032 A     2638         LDA      LTCHA,1          LATCH A SIGN BIT ON                         S03 02621
006061 001004 A     2639         JAM      DLM1             YES-                                        S03 02622
006062 006072 R
006063 015033 A     2640         LDA      LTCHB,1          LATCH B SIGN BIT ON ?                       S03 02623
006064 001004 A     2641         JAM      DLM4             YES-                                        S03 02624
006065 006102 R
006066 005001 A     2642 DLM3    TZA                       RESET MULS.                                 S03 02625
006067 055071 A     2643 DLM2    STA      MULS,1                                                       S03 02626
006070 001000 A     2644         RETU*    DLMS             EXIT                                        S03 02627
006071 106057 R
006072 015033 A     2645 DLM1    LDA      LTCHB,1                                                      S03 02628
006073 001004 A     2646         JAN      DLM7             SET MULS                                    S03 02629
006074 006107 R
006075 015034 A     2647         LDA      XALU,1                                                       S03 02630
006076 001004 A     2648         JAN      DLM7             SET MULS                                    S03 02631
006077 006107 R
006100 001000 A     2649         JMP      DLM3             RESET MULS                                  S03 02632
006101 006066 R
006102 015034 A     2650 DLM4    LDA      XALU,1           ALU RESULT NEGATIVE ?                       S03 02633
006103 001004 A     2651         JAN      DLM7             YES-SET MULS                                S03 02634
006104 006107 R
006105 001000 A     2652         JMP      DLM3             RESET MULS                                  S03 02635
006106 006066 R
006107 005101 A     2653 DLM7    INCR     01               A=1                                         S03 02636
006110 001000 A     2654         JMP      DLM2             SET MULS                                    S03 02637
006111 006067 R
                    2655         EJEC                                                                  S03 02638
                    2656 *                                                                             S03 02639
                    2657 *                                                                             S03 02640
                    2658 *                                                                             S03 02641
                    2659 *                                                                             S03 02642
                    2660 *                                                                             S03 02643
                    2661 *    FORM MACHINE STATUS REGISTER SETTING(STUS)                               S03 02644
                    2662 *    TEST CONDITION SETTINGS FOR TEST MUX(TMUX)                               S03 02645
                    2663 *    AND MISC SETTINGS: SUPERVISOR KEY, I/O KEY REG, INTERRUPT FLAG,          S03 02646
                    2664 *                       MUL SIGN                                              S03 02647
                    2665 *                                                                             S03 02648
                    2666 *  THE MACHINE STATUS REGISTER(STUS) IS AN INPUT TO THE LATCH B MUX           S03 02649
                    2667 *                                                                             S03 02650
                    2668 *    THE TEST CONDITIONS(SEE TMUX TABLE UP FRONT) ARE SELECTED BY THE         S03 02651
                    2669 *    G FIELD(WHEN T FIELD IS NOT=00) IN DETERMINING THE NEXT ROM              S03 02652
                    2670 *    ADDRESS.THIS IS DONE IN-COMPONENT CRAS.                                  S03 02653
                    2671 *                                                                             S03 02654
                    2672 *    A PSEUDO 16-BIT STATUS REGISTER(STUS) IS USED IN THE PROGRAM. IN         S03 02655
                    2673 *    THE HARDWARE THERE IS NO "REGISTER, ITS JUST GATING OF F/F'S,ETC.        S03 02656
                    2674 *    INTO THE BMUX.                                                           S03 02657
                    2675 *    SIMILARLY, A TEST CONDITION TABLE(TMUX) IS USED HERE-IN.                 S03 02658
                    2676 *                                                                             S03 02659
                    2677 *                                                                             S03 02660
                    2678 *    MACHINE STATUS "REGISTER" (STUS)                                         S03 02661
                    2679 *       BIT                                                                   S03 02662
                    2680 *       0    NOT USED                                                         S03 02663
                    2681 *       1    NOT USED                                                         S03 02664
                    2682 *       2     ALU ZERO                                                        S03 02665
                    2683 *       3    SHIFT COUNTER BIT 0                                              S03 02666
                    2684 *       4    SHIFT COUNTER BIT 1                                              S03 02667
                    2685 *       5    SHIFT COUNTER BIT 2                                              S03 02668
                    2686 *       6    SHIFT COUNTER BIT 3                                              S03 02669
                    2687 *       7    SHIFT COUNTER BIT 4                                              S03 02670
                    2688 *       8    ALU OVERFLOW                                                     S03 02671
                    2689 *       9    ALU EQUALS                                                       S03 02672
                    2690 *       10   ALU SIGN                                                         S03 02673
                    2691 *       11   ALU CARRY                                                        S03 02674
                    2692 *       12    KEY REG BIT 0,DK12     THE DAT LOOP KEY REGISTER IS             S03 02675
                    2693 *       13    KEY REG BIT 1,DK13     A 4-BIT REGISTER THAT                    S03 02676
                    2694 *       14    KEY REG BIT 2,DK14     STORES THE STATE OF                      S03 02677
                    2695 *       15    KEY REG BIT 3,DK15     ALU-UUT BITS 12-15                       S03 02678
                    2696 *                                                                             S03 02679
                    2697 *                                                                             S03 02680
                    2698 *                                                                             S03 02681
                    2699 *    TEST MUX INPUTS                                                          S03 02682
                    2700 *                                                                             S03 02683
                    2701 *       0    ALU OVERFLOW                                                     S03 02684
                    2702 *       1    I/O SENSE                                                        S03 02685
                    2703 *       2    SSW3                                                             S03 02686
                    2704 *       3    SSW2                                                             S03 02687
                    2705 *       4    SSW1                                                             S03 02688
                    2706 *       5    620/F TEST (FOR JMP, JMPM, $XEC GROUPS)                          S03 02689
                    2707 *       6    ALU EQUALS                                                       S03 02690
                    2708 *       7    ALU SIGN                                                         S03 02691
                    2709 *       8    ALU CARRY                                                        S03 02692
                    2710 *       9    ALU ZERO                                                         S03 02693
                    2711 *       10        DS  FLIP/FLOP  (SIGN STORAGE FOR OREG SHIFTING              S03 02694
                    2712 *       11   MIL15  SIGN BIT OF MEMORY LATCH                                  S03 02695
                    2713 *       12        SHIFT COUNT = -1                                             S03 02696
                    2714 *       13   A15-SIGN OF A REG FOR MUL. OPERATIONS                            S03 02697
                    2715 *       14  DAL15 NOT EQUAL TO DAL14  NALU OUTPUT BITS 14 & 15)              S03 02698
                    2716 *       15        QS FLIP/FLOP   (SAVES ALU15/OR01 FOR MUL/DIV OPS)           S03 02699
                    2717 *                                                                             S03 02700
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                    2718 ************************************************************      S03 02701
                    2719 *  BIT 11 (MIL15) IS ESTABLISHED IN MEM. OPERATIONS  COMPONENT.  *      S03 02702
                    2720 *                                                                 S03 02703
                    2721 *                                                                 S03 02704
                    2722 *                                                                 S03 02705
                    2723 *     CALLING SEQUENCE                                            S03 02706
                    2724 *       LDX     ADDR OF ROM FILEDS/DATA                           S03 02707
                    2725 *       CALL    X100                                              S03 02708
                    2726 *                                                                 S03 02709
                    2727 *                                                                 S03 02710
006112 000000 A     2728 X100    ENTR                                                      S03 02711
                    2729 *                                                                 S03 02712
                    2730 *    STORE 3-BIT D.L. KEY REGISTER INTO BITS 13-15 OF STATUS REGISTER  S03 02713
006113 015041 A     2731         LDA     STUS,1                                           S03 02714
006114 006150 A     2732         ANAI    07777          CLEAR BITS 12-15                  S03 02715
006115 007777 A
006116 055041 A     2733         STA     STUS,1         OF STATUS REGISTER                S03 02716
006117 015047 A     2734         LDA     KREG,1         KEY REG IS 4 BITS, RIGHT JUSTIFIED S03 02717
006120 004254 A     2735         LRLA    12                                               S03 02718
006121 135041 A     2736         ERA     STUS,1         INSERT CURRENT CONTENTS OF KREG   S03 02719
006122 055041 A     2737         STA     STUS,1         INTO STATUS REG                   S03 02720
                    2738 *    STORE SHIFT COUNTER INTO BITS 3-7 OF STATUS REGISTER         S03 02721
006123 015041 A     2739         LDA     STUS,1                                           S03 02722
006124 006150 A     2740         ANAI    0177407        RESET BITS 3-7                    S03 02723
006125 177407 A
006126 055041 A     2741         STA     STUS,1         OF STATUS REGISTER.               S03 02724
006127 015043 A     2742         LDA     SREG,1         SHIFT COUNTER                     S03 02725
006130 006150 A     2743         ANAI    037            GET 5 LSB'S                       S03 02726
006131 000037 A
006132 004243 A     2744         LRLA    3              POSITION IT                       S03 02727
006133 135041 A     2745         ERA     STUS,1                                           S03 02728
006134 055041 A     2746         STA     STUS,1                                           S03 02729
                    2747 *                                                                 S03 02730
                    2748 *                                                                 S03 02731
                    2749 *    THIS SEQUENCE CONTROLS TEST CONDITION BITS 1-5,10,AND 12-15  S03 02732
                    2750 *    THE ALU RELATED BITS: 0 & 6-9 FOLLOW.                        S03 02733
                    2751 *                                                                 S03 02734
                    2752 *                                                                 S03 02735
                    2753 *                                                                 S03 02736
                    2754 *    TEST BIT 1: I/O-SENSE                                        S03 02737
006135 005000 A     2755 XS10    NOP                    * NOT SIMULATED                   S03 02738
                    2756 *                              *                                 S03 02739
                    2757 *                                                                 S03 02740
                    2758 *                                                                 S03 02741
                    2759 *    TEST BITS 2,3,4: SENSE SWITCHES 3,2,1                        S03 02742
                    2760 *                                                                 S03 02743
006136 006030 A     2761         LDXI    TMUX                                             S03 02744
006137 000641 R
006140 005101 A     2762 XS15    INCR    01             A=01                              S03 02745
006141 005002 A     2763         TZB                    B=0                               S03 02746
006142 001100 A     2764         JSS1    *+5                                              S03 02747
006143 006147 R
006144 065004 A     2765         STB     4,1            SS1=0                             S03 02748
006145 001000 A     2766         JMP     *+3                                              S03 02749
006146 006150 R
006147 055004 A     2767         STA     4,1            SS1=1                             S03 02750
006150 001200 A     2768         JSS2    *+5                                              S03 02751
006151 006155 R
006152 065003 A     2769         STB     3,1            SS2=0                             S03 02752
006153 001000 A     2770         JMP     *+3                                              S03 02753
006154 006156 R
006155 055003 A     2771         STA     3,1            SS2=1                             S03 02754
006156 001400 A     2772         JSS3    *+5                                              S03 02755
006157 006163 R
006160 065002 A     2773         STB     2,1            SS3=0                             S03 02756
006161 001000 A     2774         JMP     *+3                                              S03 02757
006162 006164 R
006163 055002 A     2775         STA     2,1            SS3=1                             S03 02758
006164 006030 A     2776         LDXI    DROM                                             S03 02759
006165 000546 R
006166 006020 A     2777         LDBI    TMUX           ADDR OF TEST CONDITIONS TABLE     S03 02760
006167 000641 R
                    2778 *                                                                 S03 02761
                    2779 *                                                                 S03 02762
                    2780 *    SET 620/F TEST BIT-5- IF INST. IS                            S03 02763
                    2781 *    JMP,JMPM,OR XEC                                              S03 02764
006170 015052 A     2782 XS20    LDA     IRG2,1         GET INST.REG#2                    S03 02765
006171 005012 A     2783         TAB                    TEMP SAVE                         S03 02766
006172 006150 A     2784         ANAI    0177000                                          S03 02767
006173 177000 A
006174 004351 A     2785         LSRA    9                                                S03 02768
006175 001010 A     2786         JAZ     XS23           NOT CORRECT TYPE OF INST          S03 02769
006176 006214 R
006177 005311 A     2787         DAR                                                      S03 02770
006200 001010 A     2788         JAZ     XS21           JUMP INST'S                       S03 02771
006201 006213 R
006202 005311 A     2789         DAR                                                      S03 02772
006203 001010 A     2790         JAZ     XS21           JMPM INSTRUCTIONS                 S03 02773
006204 006213 R
006205 005311 A     2791         DAR                                                      S03 02774
006206 001010 A     2792         JAZ     XS21           XEC INSTRUCTIONS                  S03 02775
006207 006213 R
006210 005001 A     2793 XS24    TZA                                                      S03 02776
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006211 001000 A 2794          JMP     XS23          RESET BIT 5                                  S03 02777
006212 006214 R
                2795 *                                                                           S03 02778
006213 005101 A 2796 XS21     INCR    01            A=1                                          S03 02779
006214 006020 A 2797 XS23     LDBI    TMUX                                                       S03 02780
006215 000641 R
006216 056005 A 2798          STA     5,2           SET 620/F TEST CONDITIONS INTO               S03 02781
                2799 *                              POSITION 5 OF TMUX TABLE                     S03 02782
                2800 *    TEST BIT 13: STORES SIGN BIT(DAL15) OF R0 IN A0R0                      E.2*********
006217 017000 I 2801          LDA     R0                                                         E.2*********
006220 015034 A 2802          LDA     XALU,1                                                     S03 02793
006221 004241 A 2803          LRLA    1                                                          S03 02794
006222 006150 A 2804          ANAI    1                                                          S03 02795
006223 000001 A
006224 056015 A 2805          STA     13,2                                                       S03 02796
                2806 *    TEST BIT 10: STATUS OF DS F/F  1=SET  0=RESET                          S03 02797
006225 015064 A 2807 XS30     LDA     DS,1                                                       S03 02798
006226 001010 A 2808          JAZ     XS32                                                       S03 02799
006227 006231 R
006230 005101 A 2809          INCR    01                                                         S03 02800
006231 056012 A 2810 XS32     STA     10,2                                                       S03 02801
                2811 *    TEST BIT 12: SHIFT COUNT=-1                                          S03 02802
006232 015043 A 2812 XS45     LDA     SREG,1                                                     S03 02803
006233 006130 A 2813          ERAI    0177777                                                    S03 02804
006234 177777 A
006235 001010 A 2814          JAZ     XS46                                                       S03 02805
006236 006242 R
006237 005001 A 2815          TZA                                                                S03 02806
006240 001000 A 2816          JMP     *+3                                                        S03 02807
006241 006243 R
006242 005101 A 2817 XS46     INCR    01                                                         S03 02808
006243 056014 A 2818          STA     12,2                                                       S03 02809
                2819 *    TEST BIT 14: DAL15 NOT EQUAL TO DAL14.                               S03 02810
006244 015034 A 2820 XS50     LDA     XALU,1          ALU OUTPUT                               C 03 02811
006245 004341 A 2821          LSRA    1               POSITION BIT 15 TO 14                    C 03 02812
006246 135034 A 2822          ERA     XALU,1          COMPARE BITS                             C 03 02813
006247 004356 A 2823          LSRA    14              POSITION RESULT                          C 03 02814
006250 056016 A 2824          STA     14,2            SET NORMALIZE FLAG                       C 03 02815
                2825 *    TEST BIT 15: STATUS OF QS F/F  1=SET  0=RESET                        S03 02816
006251 015063 A 2826 XS60     LDA     QS,1                                                       S03 02817
006252 001010 A 2827          JAZ     *+4                                                        S03 02818
006253 006256 R
006254 001000 A 2828          JMP     XS61                                                       S03 02819
006255 006260 R
006256 001000 A 2829          JMP     *+3                                                        S03 02820
006257 006261 R
006260 005101 A 2830 XS61     INCR    01                                                         S03 02821
006261 056017 A 2831          STA     15,2                                                       S03 02822
                2832 *                                                                           S03 02823
                2833 *                                                                           S03 02824
                2834 *                                                                           S03 02825
                2835 *    THE FOLLOWING STATUS REGISTER AND TEST CONDITIONS ARE                  S03 02826
                2836 *    CONDITIONALLY CONTROLLED BY FIELDS S,T,&G.                             S03 02827
                2837 *                                                                           S03 02828
                2838 *                                                                           S03 02829
                2839 *    SET/RESET "EQUALS","STORED-CARRY","ZEROS","OVERFLOW" & "ALU SIGN"IF    S03 02830
                2840 *     (S=0&T=0&G=XX1X)-OR-(S=1&T=0&GX11X)                                   S03 02831
                2841 *     OTHERWISE SKIP TO X104                                                S03 02832
                2842 *                                                                           S03 02833
006262 015006 A 2843          LDA     XS,1            S FIELD=0 ?                              S03 02834
006263 001010 A 2844          JAZ     *+4                                                        S03 02835
006264 006267 R
006265 001000 A 2845          JMP     XS64            NO                                       S03 02836
006266 006303 R
006267 015005 A 2846          LDA     XT,1            T FIELD=0 ?                              S03 02837
006270 001010 A 2847          JAZ     *+4                                                        S03 02838
006271 006274 R
006272 001000 A 2848          JMP     XS90            NO                                       S03 02839
006273 006543 R
006274 015007 A 2849          LDA     XG,1                                                       S03 02840
006275 006150 A 2850          ANAI    02              G FIELD=XX1X ?                           S03 02841
006276 000002 A
006277 001010 A 2851          JAZ     *+4                                                        S03 02842
006300 006303 R
006301 001000 A 2852          JMP     XS65            YES-GO SAMPLE CONDITION CODES            S03 02843
006302 006345 R
006303 001000 A 2853          JMP     X120            GO CHECK IF OVFL SHOULD BE SAMPLED        S03 02844
006304 006450 R
                2854 *                                                                           S03 02845
006305 015006 A 2855 XS64     LDA     XS,1                                                       S03 02846
006306 006140 A 2856          SUBI    1               S FIELD=01 ?                             S03 02847
006307 000001 A
006310 001010 A 2857          JAZ     XS64A           IF SF=1                                  FF  *********
006311 006327 R
006312 005311 A 2858          DAR                                                              FF  *********
006313 115005 A 2859          ORA     XT,1                                                     FF  *********
006314 001010 A 2860          JAZ     *+4             IF SF=2 AND TF=0                         FF  *********
006315 006320 R
006316 001000 A 2861          JMP     XS90            IF SF=3 OR TF NE 0                       FF  *********
006317 006543 R
006320 015007 A 2862          LDA     XG,1                                                     FF  *********
006321 006150 A 2863          ANAI    2                                                        FF  *********
006322 000002 A
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006323 001010 A 2864          JAZ     XS90                                    FF  ********
006324 006543 R
006325 001000 A 2865          JMP     XS65        IF SF=2, TF=0, AND GF=XX1X  FF  ********
006326 006345 R
       006327 R 2866 XS64A    EQU     *                                       FF  ********
006327 015005 A 2867          LDA     XT,1        T FIELD=0 ?                     $03 02850
006330 001010 A 2868          JAZ     *+4                                     $03 02851
006331 006334 R
006332 001000 A 2869          JMP     XS90        NO                          $03 02852
006333 006543 R
006334 015007 A 2870          LDA     XG,1                                    $03 02853
006335 006150 A 2871          ANAI    06                                      $03 02854
006336 000006 A
006337 006140 A 2872          SUBI    06          G FIELD=X11X ?              $03 02855
006340 000006 A
006341 001010 A 2873          JAZ     X103        GO SAMPLE OVFL              $03 02856
006342 006455 R
006343 001000 A 2874          JMP     X104                                    $03 02857
006344 006506 R
       2875 *   SET "EQUALS" F/F IF ALU RESULT=ALL ONES                        $03 02858
006345 015034 A 2876 XS65     LDA     XALU,1       IS ALU OUTPUT              $03 02859
006346 005111 A 2877          IAR                  EQUAL TO ALL ONES ?        $03 02860
006347 001016 A 2878          JANZ    XS70         NO-                        $03 02861
006350 006360 R
006351 015041 A 2879          LDA     STUS,1                                  $03 02862
006352 006110 A 2880          ORAI    01000        SET "EQUALS" BIT (9)       $03 02863
006353 001000 A
006354 055041 A 2881          STA     STUS,1                                  $03 02864
       2882 *                                                                 $03 02865
006355 005101 A 2883          INCR    01                                      $03 02866
006356 001000 A 2884          JMP     XS71                                    $03 02867
006357 006365 R
       2885 *   RESET "EQUALS" BIT IF ALU RESULT NOT=ALL ONES                 $03 02868
006360 015041 A 2886 XS70     LDA     STUS,1       STATUS REGISTER            $03 02869
006361 006150 A 2887          ANAI    0176777      RESET STUS BIT 9           $03 02870
006362 176777 A
006363 055041 A 2888          STA     STUS,1                                  $03 02871
006364 005001 A 2889          TZA                                             $03 02872
006365 056006 A 2890 XS71     STA     6,2          "EQUALS" IS POSITION 6 IN TMUX  $03 02873
       2891 *                                                                 $03 02874
       2892 *   SET STORED-CARRY F/F IF CARRY OUT WAS GENERATED               $03 02875
006366 015036 A 2893 X101     LDA     CARRY,1      IF CARRY-OUT WAS           $03 02876
006367 001010 A 2894          JAZ     XS73         GENERATED DURING ALU       $03 02877
006370 006400 R
006371 015041 A 2895          LDA     STUS,1                                  $03 02878
006372 006110 A 2896          ORAI    04000        SET "STORED CARRY" BIT (11)$03 02879
006373 004000 A
006374 055041 A 2897          STA     STUS,1                                  $03 02880
       2898 *                                                                 $03 02881
006375 005101 A 2899          INCR    01                                      $03 02882
006376 001000 A 2900          JMP     XS74                                    $03 02883
006377 006405 R
       2901 *   RESET STORED-CARRY BIT IF ALU CARRY-OUT WAS NOT GENERATED     $03 02884
006400 015041 A 2902 XS73     LDA     STUS,1                                  $03 02885
006401 006150 A 2903          ANAI    0173777      RESET STUS BIT 11          $03 02886
006402 173777 A
006403 055041 A 2904          STA     STUS,1                                  $03 02887
006404 005001 A 2905          TZA                                             $03 02888
006405 056010 A 2906 XS74     STA     8,2          "CARRY" IS POSITION 8 IN  TMUX TABLE  $03 02889
       2907 *                                                                 $03 02890
       2908 *   SET "ALU OUT=ZERO" F/F IF ALU RESULT IS ZERO                   $03 02891
006406 015034 A 2909 X102     LDA     XALU,1       IS ALU OUTPUT EQUAL TO ZERO ?  $03 02892
006407 001010 A 2910          JAZ     *+4          NO                         $03 02893
006410 006413 R
006411 001000 A 2911          JMP     XS76                                    $03 02894
006412 006422 R
006413 015041 A 2912          LDA     STUS,1                                  $03 02895
006414 006110 A 2913          ORAI    4                                       $03 02896
006415 000004 A
006416 055041 A 2914          STA     STUS,1                                  $03 02897
       2915 *                                                                 $03 02898
006417 005101 A 2916          INCR    01                                      $03 02899
006420 001000 A 2917          JMP     XS78                                    $03 02900
006421 006427 R
       2918 *   RESET ALU OUT=ZERO BIT IF ALU RESULT IS NOT ZERO               $03 02901
006422 015041 A 2919 XS76     LDA     STUS,1                                  $03 02902
006423 006150 A 2920          ANAI    0177773      RESET BIT 2 OF STATUS WORD $03 02903
006424 177773 A
006425 055041 A 2921          STA     STUS,1                                  $03 02904
006426 005001 A 2922          TZA                  RESET                      $03 02905
006427 056011 A 2923 XS78     STA     9,2          "ZEROS" IS POSITION 9 IN TMUX TABLE  $03 02906
       2924 *                                                                 $03 02907
       2925 *                                                                 $03 02908
       2926 *   SET ALU SIGN BIT IF ALU RESULT WAS NEGATIVE                   $03 02909
006430 015034 A 2927 XS80     LDA     XALU,1       ALU OUTPUT STORAGE         $03 02910
006431 001002 A 2928          JAP     XS81                                    $03 02911
006432 006442 R
006433 015041 A 2929          LDA     STUS,1                                  $03 02912
006434 006110 A 2930          ORAI    02000        SET ALU SIGN BIT (10)      $03 02913
006435 002000 A
006436 055041 A 2931          STA     STUS,1                                  $03 02914
006437 005101 A 2932          INCR    01           A=1                        $03 02915
006440 001000 A 2933          JMP     XS82         SET TMUX #7                $03 02916
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006441 006447 R
                    2934 *   RESET ALU SIGN BIT IF ALU RESULT WAS POSITIVE                          S03 02917
006442 015041 A     2935 XS81   LDA     STUS,1                                                      S03 02918
006443 006150 A     2936        ANAI    0175777         RESET BIT 10                                S03 02919
006444 175777 A
006445 055041 A     2937        STA     STUS,1                                                      S03 02920
006446 005001 A     2938        TZA                     RESET TMUX #7                               S03 02921
006447 056007 A     2939 XS82   STA     7,2             ALU SIGN BIT IS POSITION 7 IN TMUX TABLE    S03 02922
                    2940 *                                                                          S03 02923
                    2941 *                                                                          S03 02924
006450 015007 A     2942 X120   LDA     XG,1                                                        S03 02925
006451 006150 A     2943        ANAI    010             G=1XXX                                      S03 02926
006452 000010 A
006453 001010 A     2944        JAZ     XS90                                                        S03 02927
006454 006543 R
                    2945 *  SAMPLE STORED OVERFLOW IF: 1. SPECIAL ALU MOVE(LA=0&LB=0/1&SH(TC)=1X    S03 02928
                    2946 *                               AND BIT 6 OF IRG2=1.                       S03 02929
                    2947 *                             2. S=0&T=0&G=1XXX.                           S03 02930
                    2948 *                             3. S=1&T=NOT 0&G=X11X.                       S03 02931
006455 002000 A     2949 X103   CALL    SALU            SPECIAL ALU MODE ?                          S03 02932
006456 004352 R
006457 001000 A     2950        JMP     X108            YES-                                        S03 02933
006460 006474 R
006461 015037 A     2951 X109   LDA     OVRFL,1         OVERFLOW ON?                                S03 02934
006462 001010 A     2952        JAZ     X107            NO-                                         S03 02935
006463 006504 R
006464 015041 A     2953        LDA     STUS,1                                                      S03 02936
006465 006110 A     2954        ORAI    0400            SET "STORED OVERFLOW" BIT (8)               S03 02937
006466 000400 A
006467 055041 A     2955        STA     STUS,1                                                      S03 02938
                    2956 *                                                                          S03 02939
006470 005101 A     2957        INCR    01                                                          S03 02940
006471 056000 A     2958        STA     0,2             "OVERFLOW" IS POSITION 0 IN TMUX TABLE      S03 02941
006472 001000 A     2959        JMP     X107            CONTINUE                                    S03 02942
006473 006504 R
                    2960 *                                                                          S03 02943
006474 006017 A     2961 X108   LDAE    YIRG2           IRG2 AT LAST CLOCK                          S03 02944
006475 003506 R
006476 006150 A     2962        ANAI    0100            IRG2 BIT 6=1 ?                              S03 02945
006477 000100 A
006500 001010 A     2963        JAZ     X107            NO-DON'T SAMPLE OVFL                        S03 02946
006501 006504 R
006502 001000 A     2964        JMP     X109            YES-SAMPLE OVFL.                            S03 02947
006503 006461 R
                    2965 *                                                                          S03 02948
                    2966 *    NO RESET OF "STORED-OVERFLOW"--FOR COMPATIBILITY WITH 620/F            S03 02949
006504 001000 A     2967 X107   JMP     XS90                                                        S03 02950
006505 006543 R
                    2968 *                                                                          S03 02951
                    2969 *                                                                          S03 02952
                    2970 *    SET/RESET  "OVERFLOW" BIT IN STUS &TMUX IF S=01&T=00&G=X01X/X10X      S03 02953
                    2971 *                                                                          S03 02954
006506 015007 A     2972 X104   LDA     XG,1                                                        S03 02955
006507 006150 A     2973        ANAI    06                                                          S03 02956
006510 000006 A
006511 006140 A     2974        SUBI    2               G FIELD=X01X ?                              S03 02957
006512 000002 A
006513 001010 A     2975        JAZ     X105            YES-GO SET OVFL BIT                         S03 02958
006514 006523 R
006515 006140 A     2976        SUBI    2               G FIELD=X10X ?                              S03 02959
006516 000002 A
006517 001010 A     2977        JAZ     X106            YES-GO RESET OVFL BIT                       S03 02960
006520 006533 R
006521 001000 A     2978        JMP     XS90                                                        S03 02961
006522 006543 R
                    2979 *    SET THE "STORED OVERFLOW" F/F : G=X01X                                S03 02962
006523 015041 A     2980 X105   LDA     STUS,1                                                      S03 02963
006524 006110 A     2981        ORAI    0400            BIT 8                                       S03 02964
006525 000400 A
006526 055041 A     2982        STA     STUS,1                                                      S03 02965
006527 005101 A     2983        INCR    01                                                          S03 02966
006530 056000 A     2984        STA     0,2             "OVERFLOW" IS POSITION 0 IN TMUX TABLE      S03 02967
006531 001000 A     2985        JMP     XS90                                                        S03 02968
006532 006543 R
                    2986 *                                                                          S03 02969
                    2987 *    RESET THE "STORED OVERFLOW" F/F: G=X10X                               S03 02970
006533 015041 A     2988 X106   LDA     STUS,1                                                      S03 02971
006534 006150 A     2989        ANAI    0177377         BIT 8                                       S03 02972
006535 177377 A
006536 055041 A     2990        STA     STUS,1                                                      S03 02973
006537 005001 A     2991        TZA                                                                 S03 02974
006540 056000 A     2992        STA     0,2             "OVERFLOW"IS POSITION 0 IN TMUX TABLE       S03 02975
006541 001000 A     2993        JMP     XS90                                                        S03 02976
006542 006543 R
                    2994 *    IF S=0, SET/RESET INTERRUPT FLAG, SUPERVISOR KEY, AND I/O             S03 02977
                    2995 *            REQUEST FLAG--AS SPECIFIED BY FIELD IMC                       S03 02978
006543 015006 A     2996 XS90   LDA     XS,1            S=0 ?                                       S03 02979
006544 001010 A     2997        JAZ     *+4                                                         S03 02980
006545 006550 R
006546 001000 A     2998        JMP*    X100            NO-EXIT                                     S03 02981
006547 1061 2 R
006550 0150 2 A     2999        LDA     XIMC,1                                                      S03 02982
006551 006140 A     3000        SUBI    05              IMC=0101                                    S03 02983
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006552 000005 A
006553 001010 A 3001          JAZ      XS91        YES-                                  S03 02984
006554 006577 R
006555 005311 A 3002          DAR                  IMC=0110                              S03 02985
006556 001010 A 3003          JAZ      XS91        YES-                                  S03 02986
006557 006577 R
006560 005311 A 3004          DAR                  IMC=0111 ?                            S03 02987
006561 001010 A 3005          JAZ      XS92        YES-                                  S03 02988
006562 006602 R
006563 005311 A 3006          DAR                  IMC=1000 ?                            S03 02989
006564 001010 A 3007          JAZ      X130        YES-                                  S03 02990
006565 006615 R
006566 005311 A 3008          DAR                  IMC=1001 ?                            S03 02991
006567 005311 A 3009          DAR                  IMC=1010 ?                            S03 02992
006570 001010 A 3010          JAZ      X134        YES-                                  S03 02993
006571 006606 R
006572 005311 A 3011          DAR                  IMC=1011 ?                            S03 02994
006573 001010 A 3012          JAZ      X136        YES                                   S03 02995
006574 006611 R
006575 001000 A 3013          JMP*     X100        EXIT                                  S03 02996
006576 106112 R
                    3014 *                                                               S03 02997
                    3015 *    IMC=0101/0110: RESET INTERRUPT FLAG                        S03 02998
006577 055067 A     3016 XS91    STA      INPF,1      CLEAR INT. BEING PROCESSED FLAG       S03 02999
006600 001000 A     3017         RETU*    X100        EXIT                                  S03 03000
006601 106112 R
                    3018 *    IMC=0111: SET INTERRUPT FLAG                               S03 03001
006602 005101 A     3019 XS92    INCR     01                                             S03 03002
006603 055067 A     3020         STA      INPF,1      SET INT. BEING PROCESSED FLAG         S03 03003
006604 001000 A     3021         RETU*    X100        EXIT                                  S03 03004
006605 106112 R
                    3022 *    IMC=1010: RESET SUPERVISOR KEY                             S03 03005
006606 055065 A     3023 X134    STA      SUPK,1                                         S03 03006
006607 001000 A     3024         RETU*    X100        EXIT                                  S03 03007
006610 106112 R
                    3025 *    IMC=1011: SET SUPERVISOR KEY                               S03 03008
006611 005111 A     3026 X136    IAR                  A=1                                   S03 03009
006612 055065 A     3027         STA      SUPK,1                                         S03 03010
006613 001000 A     3028         RETU*    X100        EXIT                                  S03 03011
006614 106112 R
                    3029 *                                                               S03 03012
                    3030 *    IMC=1000: LOAD I/O KEY REGISTER WITH 3 MSB'S OF            S03 03013
                    3031 *              ALU OUTPUT: RIGHT JUSTIFIED                      S03 03014
006615 006020 A     3032 X130    LDBI     DROM+IOKR   ADDR OF I/O KEY REGISTER           S03 03015
006616 000616 R
006617 015034 A     3033         LDA      XALU,1                                         S03 03016
006620 004355 A     3034         LSRA     13          RIGHT JUSTIFY                      S03 03017
006621 056000 A     3035         STA      0,2                                            S03 03018
006622 001000 A     3036         RETU*    X100        RETURN                             S03 03019
006623 106112 R
                    3037         EJEC                                                    S03 03020
                    3038 *                                                               S03 03021
                    3039 *                                                               S03 03022
                    3040 *    THIS ROUNTINE PERFORMS THE OPERAND REGISTER SHIFTING OPERATIONS S03 03023
                    3041 *      THE FOLLOWING CONTROL FIELDS ARE USED:OS(SC),Y(W),V,X,&LB  S03 03024
                    3042 *      ALSO USED: DS,QS,OREG,FILE BITS FA00&FA15, & ALU-OUT BIT 15. S03 03025
                    3043 *                                                               S03 03026
                    3044 *      CALLING SEQUENCE                                         S03 03027
                    3045 *       LDX      ADDR OF ROM FIELD                              S03 03028
                    3046 *       CALL     DORG                                           S03 03029
                    3047 *                                                               S03 03030
                    3048 *       RETU     OPERAND REGISTER SHIFTING COMPLETE             S03 03031
                    3049 *                                                               S03 03032
006624 000000 A     3050 DORG    ENTR                                                    S03 03033
006625 015022 A     3051         LDA      XOS,1       SHIFT OP REG. ?                    S03 03034
006626 001010 A     3052         JAZ      *+4                                            S03 03035
006627 006632 R
006630 001000 A     3053         JMP      DO01                                           S03 03036
006631 006644 R
006632 015024 A     3054         LDA      XY,1        IS Y(HARDWARE W FIELD)= 0   ?      S03 03037
006633 001010 A     3055         JAZ*     DORG        YES-NO ACTION, EXIT.               S03 03038
006634 106624 R
006635 015034 A     3056         LDA      XALU,1      STORE SIGN                         S03 03039
006636 006150 A     3057         ANAI     0100000     BIT OF ALU OUTPUT                  S03 03040
006637 100000 A
006640 004241 A     3058         LRLA     1           IN                                 S03 03041
006641 055063 A     3059         STA      QS,1        QS F/F.                            S03 03042
006642 001000 A     3060         JMP*     DORG        EXIT                               S03 03043
006643 106624 R
006644 015013 A     3061 DO01    LDA      XLB,1       LB FIELD                           S03 03044
006645 004341 A     3062         LSRA     1           SPECIFIES MASKING ?                S03 03045
006646 001010 A     3063         JAZ      *+4                                            S03 03046
006647 006652 R
006650 001000 A     3064         JMP*     DORG        YES-EXIT                           S03 03047
006651 106624 R
006652 015044 A     3065         LDA      OREG,1      GET PREV O REG CONTENTS            S03 03048
006653 054203 A     3066         STA      DOT1        TEMP SAVE                          S03 03049
                    3067 *    Y(W) FIELD SPECIFIES LEFT/RIGHT SHIFTING                   S03 03050
006654 015024 A     3068 DO02    LDA      XY,1        SHIFT OREG LEFT   ?                S03 03051
006655 001010 A     3069         JAZ      DO44        YES-                               S03 03052
006656 006756 R
                    3070 *    RIGHT SHIFTING                                             S03 03053
                    3071 *                                                               S03 03054
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006657 015025 A 3072 DD20   LDA     XX,1          GET X FIELD                          $03 03055
006660 001010 A 3073        JAZ     *+4                                                $03 03056
006661 006664 R
006662 001000 A 3074        JMP     DD22                                               $03 03057
006663 006677 R
                3075 *    X FIELD=0 :DR00 INTO DR15                                    $03 03058
006664 015044 A 3076        LDA     DREG,1                                             $03 03059
006665 004341 A 3077        LSRA    1             RIGHT SHIFT ONE                      $03 03060
006666 054171 A 3078        STA     DDT2          TEMP STORE                           $03 03061
006667 014167 A 3079        LDA     DDT1          GET PREV DREG CONTENTS               $03 03062
006670 005002 A 3080        TZB                                                        $03 03063
006671 004541 A 3081        LLSR    1             COPY PREV DR00 BIT                   $03 03064
006672 005021 A 3082        TBA                   INTO BIT 15                          $03 03065
006673 134164 A 3083        ERA     DDT2          OF NEW DREG WORD                     $03 03066
006674 055044 A 3084        STA     UREG,1                                             $03 03067
006675 001000 A 3085        RETU*   DDRG          EXIT                                 $03 03068
006676 106624 R
                3086 *                                                                 $03 03069
                3087 *                                                                 $03 03070
006677 006140 A 3088 DD22   SUBI    1             X=01 ?                               $ 03 03071
006700 000001 A
006701 001010 A 3089        JAZ     *+4                                                $03 03072
006702 006705 R
006703 001000 A 3090        JMP     DD24          NO                                   $03 03073
006704 006724 R
                3091 *    X FIELD=01 : FA00 INTO DR15                                  $03 03074
006705 015044 A 3092        LDA     DREG,1        GET DP REGISTER                      $03 03075
006706 004341 A 3093        LSRA    1             SHIFT ONE                            $03 03076
006707 054150 A 3094        STA     DDT2          TEMP STORE                           $03 03077
006710 015030 A 3095        LDA     XA,1          FILE A SOURCE ADDR                   $03 03078
006711 006120 A 3096        ADDI    R0            ADDR OF FILE A REGISTERS             $03 03079
006712 000526 R
006713 005012 A 3097        TAB                                                        $03 03080
006714 016000 A 3098        LDA     0,2           GET FILE A REGISTER                  $03 03081
006715 005002 A 3099        TZB                                                        $03 03082
006716 004541 A 3100        LLSR    1                                                  $03 03083
006717 005021 A 3101        TBA                   COPY FILE A BIT 0 INTO               $03 03084
006720 134137 A 3102        ERA     DDT2          BIT 15 OF NEW DP REG WORD            $03 03085
006721 055044 A 3103        STA     DREG,1                                             $03 03086
006722 001000 A 3104        RETU*   DDRG          EXIT                                 $03 03087
006723 106624 R
                3105 *                                                                 $03 03088
006724 015025 A 3106 DD24   LDA     XX,1          GET X FIELD                          $03 03089
006725 006140 A 3107        SUBI    2             X=10 ?                               $03 03090
006726 000002 A
006727 001010 A 3108        JAZ     *+4                                                $03 03091
006730 006733 R
006731 001000 A 3109        JMP     DD26          NO                                   $03 03092
006732 006745 R
                3110 *    X FIELD=10: DR15 INTO DR15                                   $03 03093
006733 015044 A 3111        LDA     DREG,1        GET CURRENT DP REG.                  $03 03094
006734 004341 A 3112        LSRA    1             SHIFT ONE                            $03 03095
006735 054122 A 3113        STA     DDT2          TEMP STORE                           $03 03096
006736 014120 A 3114        LDA     DDT1          GET PREV DREG CONTENTS               $03 03097
006737 006150 A 3115        ANAI    0100000       SELECT BIT 15                        $03 03098
006740 100000 A
006741 134116 A 3116        ERA     DDT2                                             D.103 03099
006742 055044 A 3117        STA     DREG,1                                           D.103 03100
006743 001000 A 3118        RETU*   DDRG          EXIT                                 $03 03101
006744 106624 R
                3119 *                                                                 $03 03102
                3120 *    X FIELD=11: SIGN STORAGE(DS) INTO DR15                       $03 03103
006745 015044 A 3121 DD26   LDA     DREG,1        GET CURRENT DP REG.                  $03 03104
006746 004341 A 3122        LSRA    1             RIGHT SHIFT ONE                      $03 03105
006747 054110 A 3123        STA     DDT2          TEMP                                 $03 03106
006750 015064 A 3124        LDA     DS,1          PREV SIGN STORAGE                    $03 03107
006751 004257 A 3125        LRLA    15            MOVE TO BIT 15 POSITION              $03 03108
006752 134105 A 3126        ERA     DDT2                                               $03 03109
006753 055044 A 3127        STA     DREG,1                                             $03 03110
006754 001000 A 3128        RETU*   DDRG          EXIT                                 $03 03111
006755 106624 R
                3129 *                                                                 $03 03112
                3130 *                                                                 $03 03113
                3131 *                                                                 $03 03114
                3132 *                                                                 $03 03115
                3133 *    COME HERE FOR LEFT SHIFTING                                  $03 03116
                3134 *                                                                 $03 03117
                3135 *                                                                 $03 03118
006756 015025 A 3136 DD44   LDA     XX,1          GET X FIELD                          $03 03119
006757 001010 A 3137        JAZ     *+4                                                $03 03120
006760 006763 R
006761 001000 A 3138        JMP     DD46                                               $03 03121
006762 006777 R
                3139 *    X FIELD=0 : DR15 INTO DR00                                   $03 03122
006763 005002 A 3140        TZB                                                        $03 03123
006764 015044 A 3141        LDA     DREG,1        GET PREV DREG WORD                   $03 03124
006765 004441 A 3142        LLRL    1             SHIFT LEFT ONE                       $03 03125
006766 054071 A 3143        STA     DDT2          TEMP STORE                           $03 03126
006767 014067 A 3144        LDA     DDT1          PREV DREG WORD                       $03 03127
006770 005002 A 3145        TZB                                                        $03 03128
006771 004441 A 3146        LLRL    1                                                  $03 03129
006772 005021 A 3147        TBA                   COPY BIT 15 OF PREV DREG WORD        $03 03130
006773 134064 A 3148        ERA     DDT2          INTO NEW BIT 0                       $03 03131
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006774 055044 A 3149          STA     DREG,1
006775 001000 A 3150          RETU*   DORG          EXIT
006776 106624 R
                3151 *
                3152 *
006777 006140 A 3153 D046     SUBI    1
007000 000001 A
007001 001010 A 3154          JAZ     *+4
007002 007005 R
007003 001000 A 3155          JMP     D048
007004 007025 R
                3156 *    X FIELD=01: FA15 INTO DR00
007005 015044 A 3157          LDA     DREG,1
007006 005002 A 3158          TZB
007007 004441 A 3159          LLRL    1             SHIFT PREV DREG WORD LEFT ONE
007010 054047 A 3160          STA     DOT2          TEMP STORE
007011 015030 A 3161          LDA     XA,1          FIE A SOURCE ADDR
007012 006120 A 3162          ADDI    R0            ADDR OF FILE A REGISTERS
007013 000526 R
007014 005012 A 3163          TAB
007015 016000 A 3164          LDA     0,2           GET LAST FILE A REG.
007016 005002 A 3165          TZB                   CONTENTS AND
007017 004441 A 3166          LLRL    1             COPY BIT 15
007020 005021 A 3167          TBA                   INTO BIT 00
007021 134036 A 3168          ERA     DOT2          OF NEW DREG WORD
007022 055044 A 3169          STA     DREG,1
007023 001000 A 3170          RETU*   DORG          EXIT
007024 106624 R
                3171 *
                3172 *
007025 015025 A 3173 D048     LDA     XX,1
007026 006140 A 3174          SUBI    2             X FIELD=10
007027 000002 A
007030 001010 A 3175          JAZ     *+4
007031 007034 R
007032 001000 A 3176          JMP     D050          NO
007033 007051 R
                3177 *    X FIELD=10: BAR OF ALU-OUT BIT 15 INTO DREG BIT 0
007034 005002 A 3178          TZB
007035 015044 A 3179          LDA     DREG,1
007036 004441 A 3180          LLRL    1             LEFT SHIFT ONE,CONTENTS OF DREG
007037 054020 A 3181          STA     DOT2
007040 015034 A 3182          LDA     XALU,1        COMPLIMENT ALU
007041 005211 A 3183          CPA                   OUTPUT AND
007042 006150 A 3184          ANAI    0100000       POSITION BIT 15
007043 100000 A
007044 004241 A 3185          LRLA    1             INTO BIT 0.
007045 134012 A 3186          ERA     DOT2          BIT 00 OF NEW DREG WORD
007046 055044 A 3187          STA     DREG,1
007047 001000 A 3188          RETU*   DORG          EXIT
007050 106624 R
                3189 *
                3190 *    X FIELD=11: ZERO INTO DR00
007051 005002 A 3191 D050     TZB
007052 015044 A 3192          LDA     DREG,1
007053 004441 A 3193          LLRL    1             LEFT SHIFT ONE,CONTENTS OF DREG
007054 055044 A 3194          STA     DREG,1
007055 001000 A 3195          JMP*    DORG
007056 106624 R
                3196 *
                3197 *
007057 000000 A 3198 DOT1     DATA    0             TEMP STORE FOR PREVIOUS DREG CONTENTS
007060 000000 A 3199 DOT2     DATA    0             TEMP STORE FOR NEW SHIFTED DREG
                3200          EJEC
                3201 *
                3202 *
                3203 *    STORE ALU OUTPUT AS SPECIFIED BY R-FIELD AND W FIELD
                3204 *
                3205 *    CALLING SEQUENCE
                3206 *    LDX   ADDR OF ROM FIELDS/DATA
                3207 *    JMPM  X200
                3208 *    RETURN
                3209 *
                3210 *
007061 000000 A 3211 X200     ENTR                  **
007062 015013 A 3212          LDA     XLB,1         DON'T OUTPUT TO
007063 004341 A 3213          LSRA    1             FILE REGISTERS
007064 001010 A 3214          JAZ     *+4
007065 007070 R
007066 001000 A 3215          JMP     X202          IF MSB OF LB FIELD IS "1"
007067 007101 R
007070 015021 A 3216          LDA     XW,1          WRITE TO FILE REGISTER ?
007071 001010 A 3217          JAZ     X202          NO-
007072 007101 R
007073 006010 A 3218          LDAI    R0            FORM ADDR
007074 000526 R
007075 125030 A 3219          ADD     XA,1          OF SPECIFIED
007076 005012 A 3220          TAB                   REG.
007077 015034 A 3221          LDA     XALU,1        STORE ALU OUTPUT
007100 056000 A 3222          STA     0,2           INTO FILE A REGISTER
                3223 *
007101 015015 A 3224 X202     LDA     XR,1          R-FIELD
007102 001010 A 3225          JAZ*    X200          EXIT-NO DESTINATION REG. SPECIFIED
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$03 03132 … $03 03208

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007103 107061 R
007104 005012 A 3226          TAB                                                    S03 03209
007105 006140 A 3227          SUBI    5          R=5 MEANS INCR SHIFT COUNTER        S03 03210
007106 000005 A
007107 001010 A 3228          JAZ     X204                                           S03 03211
007110 007142 R
007111 001002 A 3229          JAP     X206       R=6 OR 7                            S03 03212
007112 007152 R
007113 005111 A 3230          IAR                R=4 MEANS INCR P-REGISTER           S03 03213
007114 001010 A 3231          JAZ     X205                                           S03 03214
007115 007147 R
007116 005021 A 3232          TBA                                                    S03 03215
007117 006120 A 3233          ADDI    DROM+PREG-1  ADDR OF FIRST REG. DESIG. BY R FIELD  S03 03216
007120 000607 R
007121 005012 A 3234          TAB                                                    S03 03217
007122 015015 A 3235          LDA     XR,1                                           S03 03218
007123 006140 A 3236          SUBI    2                                              S03 03219
007124 000002 A
007125 001010 A 3237          JAZ     *+4                                            S03 03220
007126 007131 R
007127 001000 A 3238          JMP     X207       NO- R=1 OR 3                        S03 03221
007130 007136 R
007131 015034 A 3239          LDA     XALU,1     SHIFT COUNTER IS 5 BIT REG THAT IS  S03 03222
007132 006110 A 3240          ORAI    0177400    INCREMENTED. MUST SET UPPER BITS OF  S03 03223
007133 177400 A
               3241 *                           16 BIT WORD TO PROPERLY SIMULATE    S03 03224
007134 001000 A 3242          JMP     *+3                                            S03 03225
007135 007137 R
007136 015034 A 3243 X207     LDA     XALU,1     STORE ALU                           S03 03226
007137 056000 A 3244          STA     0,2        OUTPUT                              S03 03227
007140 001000 A 3245          RETU*   X200       EXIT                                S03 03228
007141 107061 R
007142 015043 A 3246 X204     LDA     SREG,1     INCREMENT     * SREG CONTENTS IS IN S03 03229
007143 005111 A 3247          IAR                THE SHIFT       1'S COMPLIMENT FORM S03 03230
007144 055043 A 3248          STA     SREG,1     COUNTER                             S03 03231
007145 001000 A 3249          RETU*   X200                                           S03 03232
007146 107061 R
               3250 *                                                                S03 03233
007147 045042 A 3251 X205     INR     PREG,1                                         S03 03234
007150 001000 A 3252          RETU*   X200       EXIT                                S03 03235
007151 107061 R
               3253 *    R=6: ALU BITS 13-15 TO DATA LOOP KEY REGISTER               S03 03236
               3254 *    R=7: LOAD OREG AND INCREMENT P REGISTER                     S03 03237
007152 005311 A 3255 X206     DAR                                                    S03 03238
007153 001010 A 3256          JAZ     X208                                           S03 03239
007154 007163 R
               3257 *    R=7                                                         S03 03240
007155 006020 A 3258          LDBI    DROM+OREG  ADDR OF OREG                        S03 03241
007156 000612 R
007157 015034 A 3259          LDA     XALU,1                                         S03 03242
007160 056000 A 3260          STA     0,2                                            S03 03243
007161 001000 A 3261          JMP     X205       GO INCR P REG.                      S03 03244
007162 007147 R
               3262 *    R=6                                                         S03 03245
007163 006020 A 3263 X208     LDBI    DROM+KREG                                      S03 03246
007164 000615 R
007165 015034 A 3264          LDA     XALU,1                                         S03 03247
007166 004355 A 3265          LSRA    13         RIGHT JUSTIFY 3 MSB'S OF ALU OUTPUT WORD  S03 03248
007167 056000 A 3266          STA     0,2        STORE INTO PROPER KEY REGISTER      S03 03249
007170 001000 A 3267          RETU*   X200       EXIT                                S03 03250
007171 107061 R
               3268          EJEC                                                   S03 03251
               3269 *                                                               S03 03252
               3270 *                                                               S03 03253
               3271 ****** MEMORY OPERATIONS COMPONENT ******                       S03 03254
               3272 *                                                               S03 03256
               3273 *                                                               S03 03257
               3274 *     * OPERATION CODES *                                       S03 03258
               3275 *       MOPC=0: TRANSFER ALU OUTPUT TO MIL AND IREG#1.         S03 03259
               3276 *       MOPC=1: READ FROM MEMORY TO MIL AND IREG#1.            S03 03260
               3277 *       MOPC=2: READ FROM MEMORY TO MIL.                       S03 03261
               3278 *       MOPC=3: WRITE 16-BIT ALU OUTPUT TO MEMORY              S03 03262
               3279 *       MOPC=4: WRITE ALU OUTPUT AS A BYTE TO MEMORY           S03 03263
               3280 *               (SPECIFIED BY BYTE POINTER)                    S03 03264
               3281 *                                                              S03 03265
               3282 *                                                              S03 03266
               3283 *    * ADDRESS SOURCES *                                       S03 03267
               3284 *       MADS=0: ADDRESS IS ALU OUTPUT                          S03 03268
               3285 *       MADS=1: ADDRESS IS PROGRAM COUNTER                     S03 03269
               3286 *       MADS=2: ADDRESS IS MEMORY INTERFACE LATCH(MIL)         S03 03270
               3287 *                                                              S03 03271
               3288 *                                                              S03 03272
               3289 *                                                              S03 03273
               3290 *   *   MEMORY CONDITION CODES  *                              S03 03274
               3291 *       MCCD=0: IDLE                                           S03 03275
               3292 *       MCCD=1: IDLE WITH REQUEST PENDING                    F   *********
               3293 *       MCCD=2-N: ACTIVE  (N=MEMORY TYPE)                    F   *********
               3294 *                                                              S03 03278
               3295 *                                                              S03 03279
               3296 *                                                              S03 03280
               3297 *                                                              S03 03281
               3298 *    CALLING SEQUENCE                                          S03 03282
               3299 *       CALL    MOPA                                           S03 03283
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                    3300 *                                                                                  $03 03284
                    3301 *                                                                                  $03 03286
                    3302 *                                                                                  $03 03287
                    3303 *                                                                                  $03 03288
007172 000000 A     3304 MOPA   ENTR                                                                        $03 03289
007173 006030 A     3305        LDXI    DROM            ADDR OF ROM FIELDS/DATA                             $03 03290
007174 000546 R
                    3306 *                                                                                  $03 03291
                    3307 *                                                                                  $03 03292
                    3308 *   DETERMINE MEMORY CONDITION                                                     $03 03293
007175 015055 A     3309 M003   LDA     MCCO,1          MCCO IS THE COND. CODE FOR MEM.OPERATIONS           $03 03294
007176 001010 A     3310        JAZ     *+4                                                                 $03 03295
007177 007202 R
007200 001000 A     3311        JMP     M032            MEMORY IS ACTIVE                              F     ********
007201 007346 R
                    3312 *   MEMORY IS IDLE                                                                 $03 03297
007202 002000 A     3313        CALL    MREQ            ANY MEMORY REQUEST ?                                $03 03298
007203 007663 R
007204 001010 A     3314        JAZ     M070            NO-RTN VIA LISTING ROUTINE                          $03 03299
007205 010045 R
007206 002000 A     3315 M004   CALL    M010            DETERMINE MEMORY OPERATIONS                         $03 03300
007207 007212 R
007210 001000 A     3316        JMP     M020                                                                $03 03301
007211 007267 R
                    3317 *                                                                                  $03 03302
                    3318 *                                                                                  $03 03303
                    3319 *                                                                                  $03 03304
                    3320 *   DETERMINE MEMORY OPERATION TO BE PERFORMED                                      $03 03305
                    3321 *    RETURN WITH OPERATION CODE STORED IN MOPC                                     $03 03306
007212 000000 A     3322 M010   ENTR                                                                        $03 03307
007213 015006 A     3323        LDA     XS,1            GET S FIELD                                         $03 03308
007214 001010 A     3324        JAZ     M012                                                                $03 03309
007215 007236 R
007216 015012 A     3325        LDA     XIMC,1          GET IMC FIELD                                       $03 03310
007217 006150 A     3326 M011   ANAI    03              IMC=XX00                                            $03 03311
007220 000003 A
007221 001010 A     3327        JAZ     M014            YES-                                                $03 03312
007222 007250 R
007223 006140 A     3328        SUBI    2               IMC=XX10                                            $03 03313
007224 000002 A
007225 001010 A     3329        JAZ     M016            YES                                                 $03 03314
007226 007255 R
007227 001002 A     3330        JAP     M018            IMC=XX11                                            $03 03315
007230 007262 R
                    3331 *   IMC=XX01                                                                       $03 03316
007231 006010 A     3332        LDAI    2                                                                   $03 03317
007232 000002 A
007233 055054 A     3333        STA     MOPC,1          MOPC=2                                              $03 03318
007234 001000 A     3334        RETU*   M010                                                                $03 03319
007235 107212 R
                    3335 *   S=0                                                                            $03 03320
007236 015012 A     3336 M012   LDA     XIMC,1                                                              $03 03321
007237 006140 A     3337        SUBI    04              IMC=0100 ?                                          $03 03322
007240 000004 A
007241 001010 A     3338        JAZ     *+4                                                                 $03 03323
007242 007245 R
007243 001000 A     3339        JMP     M011-1          NO                                                  $03 03324
007244 007216 R
007245 055054 A     3340        STA     MOPC,1          MOPC=0                                              $03 03325
007246 001000 A     3341        RETU*   M010                                                                $03 03326
007247 107212 R
                    3342 *   IMC=XX00                                                                       $03 03327
007250 006010 A     3343 M014   LDAI    1                                                                   $03 03328
007251 000001 A
007252 055054 A     3344        STA     MOPC,1          MOPC=1                                              $03 03329
007253 001000 A     3345        RETU*   M010                                                                $03 03330
007254 107212 R
                    3346 *   IMC=XX10                                                                       $03 03331
007255 006010 A     3347 M016   LDAI    3                                                                   $03 03332
007256 000003 A
007257 055054 A     3348        STA     MOPC,1          MOPC=3                                              $03 03333
007260 001000 A     3349        RETU*   M010                                                                $03 03334
007261 107212 R
                    3350 *   IMC=XX11                                                                       $03 03335
007262 006010 A     3351 M018   LDAI    4                                                                   $03 03336
007263 000004 A
007264 055054 A     3352        STA     MOPC,1          MOPC=4                                              $03 03337
007265 001000 A     3353        RETU*   M010                                                                $03 03338
007266 107212 R
                    3354 *                                                                                  $03 03339
                    3355 *                                                                                  $03 03340
                    3356 *   DETERMINE MEMORY ADDRESS SOURCE                                                $03 03341
007267 015006 A     3357 M020   LDA     XS,1            FIELD S=0?                                          $03 03342
007270 001010 A     3358        JAZ     M026            YES-NOT VALID ADDR SOURCE CONDITION                 $03 03343
007271 007934 R
007272 015012 A     3359        LDA     XIMC,1          GET FIELD IMC                                       $03 03344
007273 006150 A     3360        ANAI    014                                                                 $03 03345
007274 000014 A
007275 004342 A     3361        LSRA    2                                                                   $03 03346
007276 006140 A     3362        SUBI    2                                                                   $03 03347
007277 000002 A
007300 001010 A     3363        JAZ     M022            IMC=10XX                                            $03 03348
007301 007316 R
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007302 001002 A 3364          JAP     MD24          IMC=11XX                                  S03 03349
007303 007325 R
007304 005111 A 3365          IAR                                                             S03 03350
007305 001010 A 3366          JAZ     *+4                                                     S03 03351
007306 007311 R
007307 001000 A 3367          JMP     MD26                                                    S03 03352
007310 007334 R
                3368 *  ADDRES IS ALU OUTPUT (S IS NOT 0 & IMC=01XX)                          S03 03353
007311 055053 A 3369          STA     MADS,1        MADS=0                                    S03 03354
007312 015034 A 3370          LDA     XALU,1        STORE ALU OUTPUT                          S03 03355
007313 055070 A 3371          STA     LREG,1        INTO MEM ADDR SELECT REG                  S03 03356
007314 001000 A 3372          JMP     MD30          CONTINUE                                  S03 03357
007315 007337 R
                3373 *  MEM ADDR IS PROGRAM COUNTER                                           S03 03358
007316 006010 A 3374 MD22     LDAI    1                                                       S03 03359
007317 000001 A
007320 055053 A 3375          STA     MADS,1        MADS=1                                    S03 03360
007321 015042 A 3376          LDA     PREG,1                                                  S03 03361
007322 055070 A 3377          STA     LREG,1                                                  S03 03362
007323 001000 A 3378          JMP     MD30          CONTINUE                                  S03 03363
007324 007337 R
                3379 *  MEM ADDR IS MIL                                                       S03 03364
007325 006010 A 3380 MD24     LDAI    2                                                       S03 03365
007326 000002 A
007327 055053 A 3381          STA     MADS,1        MADS=2                                    S03 03366
007330 015056 A 3382          LDA     MIL,1                                                   S03 03367
007331 055070 A 3383          STA     LREG,1                                                  S03 03368
007332 001000 A 3384          JMP     MD30          CONTINUE                                  S03 03369
007333 007337 R
                3385 *  SET MADS=050 TO INDICATE NOT VALID ADDR SOURCE CONDITION              S03 03370
                3386 *  THIS WILL PRODUCE THE LETTER X ON PRINT OUT.                          S03 03371
007334 006010 A 3387 MD26     LDAI    050                                                     S03 03372
007335 000050 A
007336 055053 A 3388          STA     MADS,1                                                  S03 03373
007337 006010 A 3389 MD30     LDAI    1             SET MEM.CONDITION CODE                    S03 03374
007340 000001 A
007341 055055 A 3390          STA     MCCD,1        TO: ACTIVE BUT NOT DONE                   S03 03375
007342 005001 A 3391          TZA                                                           F   ********
007343 054621 A 3392          STA     MLIP          CLEAR COMPLETE MEMORY FLAG                F   ********
007344 001000 A 3393          JMP     MD70          NO-RTN VIA LISTING ROUTINE                S03 03376
007345 010045 R
                3394 *                                                                        S03 03377
                3395 *  COME HERE IF MCCD IS 1 TO N (MEMORY ACTIVE) 01/21/75  KERNS           F   ********
007346 005311 A 3396 MD32     DAR                   MCCD=1                                    S03 03379
007347 001010 A 3397          JAZ     MD34          YES                                       S03 03380
007350 007353 R
007351 001000 A 3398          JMP     MD36          CHECK FOR COMPLETION                      F   ********
007352 007401 R
                3399 *  MCCD=1                                                                S03 03383
007353 015054 A 3400 MD34     LDA     MDPC,1        MEM OP IS XFER ALU-OUT TO MIL/IRG1        S03 03384
007354 001010 A 3401          JAZ     MD50          YES                                       E.2********
007355 007443 R
007356 002000 A 3402          CALL    MDDR          OVERRIDE ?                                S03 03386
007357 007754 R
007360 001004 A 3403          JAN     MD38          YES-                                      S03 03387
007361 007404 R
007362 005001 A 3404          TZA                                                           F   ********
007363 054640 A 3405          STA     MPLE          CLEAR MPLE FLAG                           F   ********
007364 015054 A 3406          LDA     MDPC,1        CHECK IF STORE REQ                        F   ********
007365 006140 A 3407          SUBI    3                                                       F   ********
007366 000003 A
007367 001004 A 3408          JAN     MD36          NO                                        F   ********
007370 007401 R
007371 015070 A 3409          LDA     LREG,1                                                  F   ********
007372 145042 A 3410          SUB     PREG,1        IF LREG=PREG, SET MPLE                    F   ********
007373 001010 A 3411          JAZ     *+4           YES                                       F   ********
007374 007377 R
007375 001000 A 3412          JMP     MD36          NO                                        F   ********
007376 007401 R
007377 005101 A 3413          INCR    1                                                       F   ********
007400 054623 A 3414          STA     MPLE                                                    F   ********
                3415 *  MEMORY REQUESTED OR ACTIVE                                           F   ********
007401 045055 A 3416 MD36     INR     MCCD,1        UPDATE MEMORY CONDITION CODE              F   ********
007402 001000 A 3417          JMP     MD40          CHECK FOR MEMORY COMPLETE OR WAIT         F   ********
007403 007410 R
                3418 *  MCCD=1 WITH OVERRIDE                                                  S03 03390
007404 002000 A 3419 MD38     CALL    MD10          DETERMINE MEMORY OPERATION                S03 03394
007405 007212 R
                3420 *                              MAINTAIN OLD ADDR SOURCE                  S03 03395
007406 001000 A 3421          JMP     MD36          SET MCCD=2 AND EXIT                       S03 03396
007407 007401 R
                3422 *                                                                        S03 03397
                3423 *                                                                        S03 03398
                3424 *  ENTER HERE IF MEMORY IS REQUESTED OR ACTIVE                           F   ********
                3425 *                                                                        F   ********
                3426 *   MEMORY CYCLE COMPLETE?                                               F   ********
007410 R        3427 MD40     EQU     *                                                       F   ********
007410 005001 A 3428          TZA                                                           F   ********
007411 054553 A 3429          STA     MLIP          CLEAR COMPLETE MEMORY FLAG                F   ********
007412 015055 A 3430          LDA     MCCD,1                                                  F   ********
007413 147000 I 3431          SUB     MTYP                                                    F   ********
007414 001002 A 3432          JAP     MD50          IF MEMORY DONE                            F   ********
007415 007443 R
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                    3433 *    WAIT FOR MEMORY DONE?                                                    F  ********
007416 015006 A     3434          LDA     XS,1                                                       F  ********
007417 001010 A     3435          JAZ     *+4             IF S=0                                     F  ********
007420 007423 R
007421 001000 A     3436          JMP     MD41                                                       F  ********
007422 007427 R
007423 015012 A     3437          LDA     XIMC,1                                                     F  ********
007424 005311 A     3438          DAR                                                                F  ********
007425 001010 A     3439          JAZ     MD45            IF IMC=1                                   F  ********
007426 007435 R
                    3440 *     PENDING MEMORY REQUEST?                                               F  ********
007427 002000 A     3441 MD41     CALL    MREQ            ANY NEW MEMORY REQUESTS                    F  ********
007430 007663 R
007431 001010 A     3442          JAZ     MD70            NO, RETURN VIA LISTING ROUTINE             F  ********
007432 010045 R
007433 001000 A     3443          JMP     MD45            COMPLETE CURRENT REQUEST                   F  ********
007434 007435 R
                    3444 MD45     EQU     *                                                          F  ********
007435 017000 I     3445          LDA     MTYP            MEMORY COMPLETION COUNT                    F  ********
007436 055055 A     3446          STA     MCCD,1          SET COMPLETION CODE TO COMPLETE            F  ********
007437 005101 A     3447          INCR    1                                                          F  ********
007440 054524 A     3448          STA     MLIP            SET COMPLETE MEMORY FLAG                   F  ********
007441 001000 A     3449          JMP     MD70            RETURN VIA LISTING ROUTINE                 F  ********
007442 010045 R
007443 002000 A     3450 MD50     CALL    MDPB            GET MEMORY ADDRESS                            S03 03401
007444 007646 R
007445 015054 A     3451          LDA     MDPC,1                                                        S03 03402
007446 001010 A     3452          JAZ     MD52            MDPC=0                                        S03 03403
007447 007475 R
007450 005311 A     3453          DAR                     MDPC=1 ?                                      S03 03404
007451 001010 A     3454          JAZ     MD54            YES-                                          S03 03405
007452 007525 R
007453 005311 A     3455          DAR                     MDPC=2 ?                                      S03 03406
007454 001010 A     3456          JAZ     MD56            YES-                                          S03 03407
007455 007532 R
007456 005311 A     3457          DAR                     MDPC=3 ?                                      S03 03408
007457 001010 A     3458          JAZ     MD58            YES-                                          S03 03409
007460 007536 R
007461 005311 A     3459          DAR                     MDPC=4 ?                                      S03 03410
007462 001010 A     3460          JAZ     MD60            YES-                                          S03 03411
007463 007556 R
007464 002000 A     3461          CALL    SIOUT,3,MD51      OUTPUT ERROR                                S03 03412
007465 015406 R
007466 000003 A
007467 007472 R
007470 001000 A     3462          JMP     MD53            CONTINUE SIMULATION                           S03 03413
007471 007500 R
007472 120240 A     3463 MD51     DATA    '  MSI3'        'UNDEFINED OPCODE                             S03 03414
007473 146723 A
007474 130663 A
                    3464 *                                                                               S03 03415
                    3465 *    MDPC=0: XFER ALU OUTPUT TO MIL & IRG1.                                     S03 03416
007475 015034 A     3466 MD52     LDA     XALU,1                                                        S03 03417
007476 055056 A     3467          STA     MIL,1                                                         S03 03418
007477 055051 A     3468          STA     IRG1,1                                                        S03 03419
                    3469 *    ESTABLISH TMUX BIT 11: MIL15= SIGN/INDIRECT BIT OF MEM LATCH            S03 03420
007500 006020 A     3470 MD53     LDBI    TMUX              ADDR OF TEST CONDITIONS TABLE               S03 03421
007501 000641 R
007502 015056 A     3471          LDA     MIL,1           GET MIL REGISTER                              S03 03422
007503 001004 A     3472          JAN     XS41                                                          S03 03423
007504 007510 R
007505 005001 A     3473          TZA                                                                   S03 03424
007506 001000 A     3474          JMP     *+3                                                           S03 03425
007507 007511 R
007510 005101 A     3475 XS41     INCR    01                                                            S03 03426
007511 056013 A     3476          STA     11,2                                                          S03 03427
007512 002000 A     3477          CALL    MREQ            ANY MEM REQUEST  ?                            S03 03428
007513 007663 R
007514 001010 A     3478          JAZ     *+4             NO-                                           S03 03429
007515 007520 R
007516 001000 A     3479          JMP     MD64            YES-GO DETERMINE MEM. OPERATION               S03 03430
007517 007206 R
007520 005001 A     3480          TZA                                                                   S03 03431
007521 055055 A     3481          STA     MCCD,1          SET MCCD=0                                    S03 03432
007522 054442 A     3482          STA     MLIP            CLEAR COMPLETE MEMORY FLAG                 F  ********
007523 001000 A     3483          JMP     MD70            RTN VIA LISTING ROUTINE                       S03 03433
007524 010045 R
                    3484 *    MDPC=1:READ FROM MEMORY TO MIL AND IRG1                                    S03 03434
007525 016000 A     3485 MD54     LDA     0,2             B REG CONTAINS MEM ADDR                       S03 03435
007526 055056 A     3486          STA     MIL,1                                                         S03 03436
007527 055051 A     3487          STA     IRG1,1                                                        S03 03437
007530 001000 A     3488          JMP     MD53            GO CHECK FOR MEM REQUEST                      S03 03438
007531 007500 R
                    3489 *    MDPC=2:READ FROM MEMORY TO MIL.                                            S03 03439
007532 016000 A     3490 MD56     LDA     0,2             B REG CONTAINS MEM ADDR                       S03 03440
007533 055056 A     3491          STA     MIL,1                                                         S03 03441
007534 001000 A     3492          JMP     MD53                                                          S03 03442
007535 007500 R
                    3493 *    WRITE 16-BIT ALU OUTPUT TO MEMORY                                          S03 03443
007536 002000 A     3494 MD58     CALL    PMEM            CHECK PROTECTED MEMORY                        S03 03444
007537 007622 R
007540 015034 A     3495          LDA     XALU,1                                                        S03 03445
007541 056000 A     3496          STA     0,2             B REG. CONTAINS MEM ADDR VIA MDPB             S03 03446
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                    3497 *    IF MPLE SET, WRITE OUTPUT INTO IRG1 (FOR PIPELINE PURPOSES)      F ********
007542 014461 A     3498      LDA     MPLE                                                     F ********
007543 005311 A     3499      DAR                                                              F ********
007544 001002 A     3500      JAP     *+4             IF MPLE SET                              F ********
007545 007550 R
007546 001000 A     3501      JMP     M053            GO CHECK FOR MEM. REQUEST                    S03 03451
007547 007500 R
007550 015034 A     3502      LDA     XALU,1                                                       S03 03452
007551 055051 A     3503      STA     IRG1,1                                                       S03 03453
007552 005001 A     3504 M059 TZA                                                              F ********
007553 054450 A     3505      STA     MPLE            CLEAR MPLE                               F ********
007554 001000 A     3506      JMP     M053            GO CHECK FOR MEM REQUEST                     S03 03454
007555 007500 R
                    3507 *    WRITE ALU OUTPUT AS A BYTE TO MEMORY                                 S03 03455
                    3508 *                                                                         S03 03456
007556 002000 A     3509 M060 CALL    PMEM            CHECK PROTECTED MEMORY                       S03 03457
007557 007622 R
007560 015060 A     3510      LDA     MBYC,1          GET BYTE DESIGNATOR                          S03 03458
007561 001010 A     3511      JAZ     *+4             1=RIGHT BYTE  0=LEFT BYTE              C.1 03 03459
007562 007565 R
007563 001000 A     3512      JMP     M061                                                   C.1 03 03460
007564 007576 R
007565 016000 A     3513      LDA     0,2             B REG CONTAINS MEM ADDR VIA MOPB             S03 03461
007566 154031 A     3514      ANA     M06B            GET RIGHT BYTE THAT'S IN MEMORY              S03 03462
007567 054027 A     3515      STA     M06A                                                         S03 03463
007570 015034 A     3516      LDA     XALU,1          STORE LEFT BYTE OF                           S03 03464
007571 154027 A     3517      ANA     M06C            ALU-OUTPUT ALONG WITH                        S03 03465
007572 134024 A     3518      ERA     M06A            RIGHT BYTE OF ORIGINAL                       S03 03466
007573 056000 A     3519      STA     0,2             WORD IN MEMORY.                              S03 03467
007574 001000 A     3520      JMP     M062                                                         S03 03468
007575 007605 R
                    3521 *    RIGHT BYTE                                                           S03 03469
007576 016000 A     3522 M061 LDA     0,2                                                          S03 03470
007577 154021 A     3523      ANA     M06C                                                         S03 03471
007600 054016 A     3524      STA     M06A                                                         S03 03472
007601 015034 A     3525      LDA     XALU,1                                                       S03 03473
007602 154015 A     3526      ANA     M06B                                                         S03 03474
007603 134013 A     3527      ERA     M06A                                                         S03 03475
007604 056000 A     3528      STA     0,2                                                          S03 03476
                    3529 *    IF MPLE SET, PUT NEW MEMORY WORD INTO IRG1(FOR PIPELINE PURPOSES)F ********
007605 014416 A     3530 M062 LDA     MPLE                                                     F ********
007606 005311 A     3531      DAR                                                              F ********
007607 001002 A     3532      JAP     *+4             IF MPLE SET                              F ********
007610 007613 R
007611 001000 A     3533      JMP     M053            GO CHECK FOR MEMORY REQUEST                  S03 03481
007612 007500 R
007613 016000 A     3534      LDA     0,2                                                          S03 03482
007614 055051 A     3535      STA     IRG1,1                                                       S03 03483
007615 001000 A     3536      JMP     M059                                                     F ********
007616 007552 R
007617 000000 A     3537 M06A DATA    0               TEMP STORE                                   S03 03485
007620 000377 A     3538 M06B DATA    0377            MASK                                         S03 03486
007621 177400 A     3539 M06C DATA    0177400         LEFT BYTE MASK                         C.1 03 03487
                    3540 *                                                                         S03 03488
                    3541 *                                                                         S03 03489
                    3542 *    SUBROUTINE TO CHECK IF MEMORY REF IS OUTSIDE DELARED MAIN MEMORY     S03 03490
                    3543 *                                                                         S03 03491
                    3544 *    CALLING SEQUENCE                                                     S03 03492
                    3545 *    LDB     MEMORY ADDRESS                                               S03 03493
                    3546 *    CALL    PMEM                                                         S03 03494
                    3547 *                                                                         S03 03495
                    3548 *    RETURN--IF ERROR,ERROR MESSAGE AND BYPASS READ/WRITE                 S03 03496
                    3549 *                                                                         S03 03497
007622 000000 A     3550 PMEM ENTR                                                                 S03 03498
007623 005021 A     3551      TBA             MEMORY ADDRESS                                       S03 03499
007624 006140 A     3552      SUBI    MMEM    START OF MAIN MEMORY                           F ********
007625 000000 R
007626 001004 A     3553      JAN     PM1     BELOW MAIN MEMORY                                    S03 03501
007627 007635 R
007630 005021 A     3554      TBA                                                                  S03 03502
007631 006140 A     3555      SUBI    SMLTR   TOP OF MAIN MEMORY+1                                S03 03503
007632 000201 R
007633 001004 A     3556      JAN*    PMEM    MEMORY ADDR OK                                       S03 03504
007634 107622 R
007635 002000 A     3557 PM1  CALL    SIOUT,3,MFAIL   OUTPUT ERROR                                 S03 03505
007636 015406 R
007637 000003 A
007640 007643 R
007641 001000 A     3558      JMP     M053            CONTINUE SIMULATION                          S03 03506
007642 007500 R
007643 120240 A     3559 MFAIL DATA   '  MS14'        MAIN MEMORY ERROR                            S03 03507
007644 146723 A
007645 130664 A
                    3560 *                                                                         S03 03508
                    3561 *                                                                         S03 03509
                    3562 *    GET MEM ADDR STORED IN L REGISTER                                    S03 03510
                    3563 *    RETURN WITH ADDR IN B REG.                                           S03 03511
007646 000000 A     3564 MOPB ENTR                                                                 S03 03512
007647 015053 A     3565      LDA     MADS,1          GET ADDR SOURCE CODE                         S03 03513
007650 006140 A     3566      SUBI    3               VALID MADS #                                 S03 03514
007651 000003 A
007652 001004 A     3567      JAN     MOP1                                                         S03 03515
007653 007657 R
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                    3568 *    SET ADDR TO 177777 AS DEFAULT IF MADS NOT 0,1,OR 2.                    S03 03516
007654 005302 A     3569          DECR    02              B=-1                                     S03 03517
007655 001000 A     3570          RETU*   MOPB                                                     S03 03518
0**### 107646 R
007657 015070 A     3571 MOP1     LDA     LREG,1                                                   S03 03519
007660 005012 A     3572          TAB                                                              S03 03520
007661 001000 A     3573          RETU*   MOPB                                                     S03 03521
007662 107646 R
                    3574 *                                                                         S03 03522
                    3575 *                                                                         S03 03523
                    3576 *    SUBROUTINE TO CHECK FOR MEMORY REQUEST                               S03 03524
                    3577 *     CALLING SEQUENCE                                                    S03 03525
                    3578 *       LDX     ADDR OF DROM                                             S03 03526
                    3579 *       CALL    MREQ                                                     S03 03527
                    3580 *                                                                        S03 03528
                    3581 *     RETURN: A REG=0=NO REQUEST. A=-1=REQUEST                           S03 03529
                    3582 *                                                                        S03 03530
                    3583 *                                                                        S03 03531
007663 000000 A     3584 MREQ     ENTR                                                             S03 03532
007664 015006 A     3585          LDA     XS,1            S=0                                      S03 03533
007665 001010 A     3586          JAZ     *+4                                                      S03 03534
007666 007671 R
007667 001000 A     3587          JMP     MRE1            AND                                      S03 03535
007670 007703 R
007671 015012 A     3588          LDA     XIMC,1                                                   S03 03536
007672 006140 A     3589          SUBI    04              IMC=0100                                 S03 03537
007673 000004 A
007674 001010 A     3590          JAZ     *+4                                                      S03 03538
007675 007700 R
007676 001000 A     3591          JMP     MRE4            IS REQUEST                               S03 03539
007677 007741 R
007700 005301 A     3592 MRE2     DECR    01              SET A=-1                                 S03 03540
007701 001000 A     3593          RETU*   MREQ            RETURN                                   S03 03541
007702 107663 R
007703 002000 A     3594 MRE1     CALL    MOOR            OVERRIDE ?                               S03 03542
007704 007754 R
007705 001004 A     3595          JAN     MRE4            YES-THEN NO MEM REQUEST                  S03 03543
007706 007741 R
007707 015006 A     3596          LDA     XS,1                                                     S03 03544
007710 005311 A     3597          DAR                     S=1 ?                                    S03 03545
007711 001010 A     3598          JAZ     MRE2            YES-THIS IS MEM REQ                      S03 03546
007712 007700 R
007713 005311 A     3599          DAR                     S=2 ?                                    S03 03547
007714 001010 A     3600          JAZ     *+4             YES-                                     S03 03548
007715 007720 R
007716 001000 A     3601          JMP     MRE3            S=3                                      S03 03549
007717 007733 R
                    3602 *    S=2                                                                  S03 03550
007720 015005 A     3603          LDA     XT,1            T=0 ?                                    S03 03551
007721 001010 A     3604          JAZ     MRE2            YES=MEM REQUEST                          S03 03552
007722 007700 R
007723 002000 A     3605          CALL    MREZ            CONDITION SPECIFIED BY G IS FALSE ?      S03 03553
007724 007744 R
007725 001020 A     3606          JBZ     *+4                                                      S03 03554
007726 007731 R
007727 001000 A     3607          JMP     MRE4            NO-NO REQUEST                            S03 03555
007730 007741 R
007731 001000 A     3608          JMP     MRE2            YES REQUEST                              S03 03556
007732 007700 R
                    3609 *    S=3                                                                  S03 03557
007733 002000 A     3610 MRE3     CALL    MREZ            CONDITION SPECIFIED BY G IS TRUE ?       S03 03558
007734 007744 R
007735 001020 A     3611          JBZ     MRE4            NO-NO REQUEST                            S03 03559
007736 007741 R
007737 001000 A     3612          JMP     MRE2            YES REQUEST                              S03 03560
007740 007700 R
                    3613 *                                                                         S03 03561
007741 005001 A     3614 MRE4     TZA                     A=0=NO REQUEST                           S03 03562
007742 001000 A     3615          RETU*   MREQ                                                     S03 03563
007743 107663 R
                    3616 *                                                                         S03 03564
                    3617 *    CHECK IF TEST CONDITION SPECIFIED BY G FIELD IS TRUE OR FALSE        S03 03565
                    3618 *       RETURN: B=0=FALSE  B=NOT ZERO=TRUE                                S03 03566
007744 000000 A     3619 MREZ     ENTR                                                             S03 03567
007745 015007 A     3620          LDA     XG,1            GET G FIELD                              S03 03568
007746 006120 A     3621          ADDI    TMUX            ADDR OF TEST CONDITIONS TABLE            S03 03569
007747 000641 R
007750 005012 A     3622          TAB                                                              S03 03570
007751 026000 A     3623          LDB     0,2             TEST CONDITION TRUE                      S03 03571
007752 001000 A     3624          RETU*   MREZ            RETURN                                   S03 03572
007753 107744 R
                    3625 *                                                                         S03 03573
                    3626 *                                                                         S03 03574
                    3627 *    SUBROUTINE TO CHECK FOR OVERRIDE                                     S03 03575
                    3628 *     CALLING SEQUENCE                                                    S03 03576
                    3629 *       LDX     ADDR OF DROM                                             S03 03577
                    3630 *       CALL    MOVR                                                     S03 03578
                    3631 *                                                                        S03 03579
                    3632 *     RETURN: A REG=0=NO OVERRIDE, A=-1=OVERRIDE                         S03 03580
                    3633 *                                                                        S03 03581
                    3634 *    OVERRIDE CONDITIONS: IN=00XX &[S=1 OR (T=NOT ZERO & S=2 & TEST       S03 03582
                    3635 *                                  CONDITION SPECIFIED BY G IS FALSE) -S03 03583
                    3636 *                                  OR-(S=3 & TEST CONDITION SPECIFIED   S03 03584
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                    3637 *                                                                                  S03 03585
                    3638 *                                                                                  S03 03586
007754 000000 A     3639 MOOR   ENTR                                                                        S03 03587
007755 015012 A     3640        LDA     XIMC,1      IMC FIELD                                               S03 03588
007756 006150 A     3641        ANAI    014         EQUALS 00XX ?                                           S03 03589
007757 000014 A
007760 001010 A     3642        JAZ     MOO1        YES-CONTINUE                                            S03 03590
007761 007765 R
007762 005001 A     3643 MOO2   TZA                                                                         S03 03591
007763 001000 A     3644        RETU*   MOOR                                                                S03 03592
007764 107754 R
007765 015006 A     3645 MOO1   LDA     XS,1                                                                S03 03593
007766 006140 A     3646        SUBI    1                                                                   S03 03594
007767 000001 A
007770 001010 A     3647        JAZ     MOO3        YES OVERRIDE                                            S03 03595
007771 010033 R
                    3648 *                                                                                  S03 03596
007772 015006 A     3649        LDA     XS,1                                                                S03 03597
007773 006140 A     3650        SUBI    2           S=2 ?                                                   S03 03598
007774 000002 A
007775 001010 A     3651        JAZ     *+4                                                                 S03 03599
007776 010001 R
007777 001000 A     3652        JMP     MOO4        NO                                                      S03 03600
010000 010014 R
010001 015005 A     3653        LDA     XT,1        T=0 ?                                                   S03 03601
010002 001010 A     3654        JAZ     MOO3        YES-OVERIDE                                             S03 03602
010003 010033 R
010004 002000 A     3655        CALL    MREZ        TEST CONDITION SPECIFIED BY G FIELD FALSE?              S03 03603
010005 007744 R
010006 001020 A     3656        JBZ     *+4                                                                 S03 03604
010007 010012 R
010010 001000 A     3657        JMP     MOO4        N/-N/ OVERRIDE                                          S03 03605
010011 010014 R
010012 001000 A     3658        JMP     MOO3        YES-OVERRIDE                                            S03 03606
010013 010033 R
                    3659 *                                                                                  S03 03607
010014 015006 A     3660 MOO4   LDA     XS,1                                                                S03 03608
010015 006140 A     3661        SUBI    3                                                                   S03 03609
010016 000003 A
010017 001010 A     3662        JAZ     *+4                                                                 S03 03610
010020 010023 R
010021 001000 A     3663        JMP     MOO2        EXIT-NO OVERRIDE                                        S03 03611
010022 007762 R
010023 002000 A     3664        CALL    MREZ        TEST CONDITION SPECIFIED BY G FIELD TRUE ?              S03 03612
010024 007744 R
010025 001020 A     3665        JBZ     *+4                                                                 S03 03613
010026 010031 R
010027 001000 A     3666        JMP     MOO3        YES-OVERRIVE                                            S03 03614
010030 010033 R
010031 001000 A     3667        JMP     MOO2        NO-NO OVERRIDE                                          S03 03615
010032 007762 R
                    3668 *                                                                                  S03 03616
010033 005301 A     3669 MOO3   DECR    01          A=-1                                                    S03 03617
010034 001000 A     3670        RETU*   MOOR        RETURN                                                  S03 03618
010035 107754 R
                    3671 *                                                                                  S03 03619
                    3672 *    CHECK IF MEM. CYCLE COMPLETE                                                  S03 03620
                    3673 *                                                                                  S03 03621
010036 014126 A     3674 MO72   LDA     MLIP        COMPLETE MEM. CYCLE FLAG                                S03 03622
010037 001010 A     3675        JAZ*    MOPA        EXIT                                                    S03 03623
010040 107172 R
010041 005001 A     3676        TZA                                                                         S03 03624
010042 054122 A     3677        STA     MLIP                                                                S03 03625
010043 001000 A     3678        JMP     MOPA+1      GO COMPLETE MEMORY CYCLE                                S03 03626
010044 007173 R
                    3679 *                                                                                  S03 03627
                    3680 *                                                                                  S03 03628
                    3681 *    LIST MEMORY OPERATIONS(IF TRACE FLAG IS ON)                                   S03 03629
                    3682 *                                                                                  S03 03630
                    3683 *                                                                                  S03 03631
010045 R            3684 MO70   EQU     *                                                                   E. P********
010045 002000 A     3685        JMPM    TRSETA      CHECK IF WITHIN BOUNDS                                  S03 03635
010046 014715 R
010047 001004 A     3686        JAN     MO72        NO-DO NOT TRACE                                         S03 03636
010050 010036 R
010051 002000 A     3687        CALL    SPAC        SPACE LO                                                S03 03637
010052 014747 R
                    3688 *                                                                                  S03 03638
                    3689 *    LIST MEMORY CONDITION CODE(MCCO)                                              S03 03639
010053 006030 A     3690        LDXI    DROM                                                                S03 03640
010054 000546 R
010055 015055 A     3691        LDA     MCCO,1                                                              S03 03641
010056 124127 A     3692        ADD     MLIU        ASCII FOR SPACE,ZERO(0120260)                           S03 03642
010057 054111 A     3693        STA     MLIY+3                                                              S03 03643
010060 002000 A     3694        CALL    LOOUT,4,MLIY                                                        S03 03644
010061 015470 R
010062 000004 A
010063 010166 R
                    3695 *    LIST MEMORY OPERATION CODE(MOPC)                                              S03 03645
010064 006030 A     3696        LDXI    DROM                                                                S03 03646
010065 000546 R
010066 015054 A     3697        LDA     MOPC,1                                                              S03 03647
010067 124116 A     3698        ADD     MLIU                                                                S03 03648
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0010070 054104 A 3699          STA     MLIX+3                                  S03 03649
0010071 002000 A 3700          CALL    LOOUT,4,MLIX                            S03 03650
0010072 015470 R
0010073 000004 A
0010074 010172 R
                3701 *    LIST MEMORY ADDRESS CODE(MADS)                       S03 03651
0010075 006030 A 3702          LDXI    DROM                                    S03 03652
0010076 000546 R
0010077 015053 A 3703          LDA     MADS,1                                  S03 03653
0010100 124105 A 3704          ADD     MLIU                                    S03 03654
0010101 054077 A 3705          STA     MLIW+3                                  S03 03655
0010102 002000 A 3706          CALL    LOOUT,4,MLIW                            S03 03656
0010103 015470 R
0010104 000004 A
0010105 010176 R
                3707 *    LIST MEMORY BYTE DESIGNATOR(MBYC)                    S03 03657
0010106 006030 A 3708          LDXI    DROM                                    S03 03658
0010107 000546 R
0010110 015060 A 3709          LDA     MBYC,1                                  S03 03659
0010111 124074 A 3710          ADD     MLIU                                    S03 03660
0010112 054072 A 3711          STA     MLIV+3                                  S03 03661
0010113 002000 A 3712          CALL    LOOUT,4,MLIV                            S03 03662
0010114 015470 R
0010115 000004 A
0010116 010202 R
                3713 *    LIST CONTENTS OF MEMORY INTERFACE LATCH(MIL)          S03 03663
0010117 006030 A 3714          LDXI    MLIT+4                                  S03 03664
0010120 010213 R
0010121 006020 A 3715          LDBI    DROM            ADD OF ROM FIELDS/DATA  S03 03665
0010122 000546 R
0010123 026056 A 3716          LDB     MIL,2                                   S03 03666
0010124 002000 A 3717          CALL    OH              CONVERT TO ASCII        S03 03667
0010125 014514 R
0010126 002000 A 3718          CALL    LOOUT,6,MLIT                            S03 03668
0010127 015470 R
0010130 000006 A
0010131 010207 R
                3719 *    LIST CONTENTS OF INST REG #1(IRG1)                   S03 03669
0010132 006030 A 3720          LDXI    MLIS+4                                  S03 03670
0010133 010221 R
0010134 006020 A 3721          LDBI    DROM                                    S03 03671
0010135 000546 R
0010136 026051 A 3722          LDB     IRG1,2                                  S03 03672
0010137 002000 A 3723          CALL    OH              CONVERT TO ASCII        S03 03673
0010140 014514 R
0010141 002000 A 3724          CALL    LOOUT,6,MLIS                            S03 03674
0010142 015470 R
0010143 000006 A
0010144 010215 R
                3725 *                                                         S03 03675
                3726 *    LIST MAIN MEMORY ADDRESS AND CONTENTS BASED UPON MOPC & MADS.  S03 03676
0010145 006030 A 3727          LDXI    DROM                                    S03 03677
0010146 000546 R
0010147 002000 A 3728          CALL    MOPB            GET MEMORY ADDRESS      S03 03678
0010150 007646 R
0010151 005021 A 3729          TBA                                             S03 03679
0010152 002000 A 3730          CALL    S200            LIST MAIN MEM ADDR&CONTENTS  S03 03680
0010153 001623 R
0010154 014010 A 3731          LDA     MLIP            COMPLETE MEM. CYCLE FLAG  S03 03681
0010155 001010 A 3732          JAZ*    MOPA            EXIT                    S03 03682
0010156 107172 R
0010157 005001 A 3733          TZA                                             S03 03683
0010160 054004 A 3734          STA     MLIP                                    S03 03684
0010161 002000 A 3735          CALL    TPFRM           TOP OF FORM             S03 03685
0010162 014760 R
0010163 001000 A 3736          JMP     MOPA+1          GO COMPLETE MEMORY CYCLE  S03 03686
0010164 007173 R
                3737 *                                                         S03 03687
                3738 *                                                         S03 03688
0010165 000000 A 3739 MLIP     DATA    0               COMPLETE MEMORY CYCLE   S03 03689
0010166 120240 A 3740 MLIY     DATA    .   MCCO    .                           S03 03690
0010167 146703 A
0010170 141717 A
0010171 120240 A
0010172 120240 A 3741 MLIX     DATA    .   MOPC    .                           S03 03691
0010173 146717 A
0010174 150303 A
0010175 120240 A
0010176 120240 A 3742 MLIW     DATA    .   MADS    .                           S03 03692
0010177 146701 A
0010200 142323 A
0010201 120240 A
0010202 120240 A 3743 MLIV     DATA    .   MBYC    .                           S03 03693
0010203 146702 A
0010204 154703 A
0010205 120240 A
0010206 120260 A 3744 MLIU     DATA    0120260         SPACE-ZERO              S03 03694
0010207 120240 A 3745 MLIT     DATA    .   MIR     .                           S03 03695
0010210 146711 A
0010211 151240 A
0010212 120240 A
0010213 120240 A
0010214 120240 A
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010215 120240 A 3746 MLIS   DATA   *  IBR      *                                        S03 03696
010216 144702 A
010217 151240 A
010220 120240 A
010221 120240 A
010222 120240 A
010223 000000 A 3747 MLIR   DATA   0            FLAG TO INDICATE MCCD=2 FOR LISTING    S03 03697
010224 000000 A 3748 MPLE   DATA   0            PIPELINE FLAG                        F *********
                3749        EJEC                                                      S03 03698
                3750 *                                                                S03 03699
                3751 *      ALTER/DISPLAY MICRO REGISTERS                             S03 03700
                3752 *                                                                S03 03701
010225          3753 E100   BSS    0                                                  S03 03702
010225 002000 A 3754        JMPM   PBUF           SETUP PRINTER BUFFER                S03 03703
010226 014575 R
010227 002000 A 3755        JMPM   FETCHA         INPUT REGISTER NUMBER               S03 03704
010230 015644 R
010231 001010 A 3756        JAZ    EXC90                                              S03 03705
010232 001147 R
010233 054345 A 3757        STA    E105           SAVE INPUT                          S03 03706
010234 006140 A 3758        SUBI   0301           ASCII A ?                           S03 03707
010235 000301 A
010236 001010 A 3759        JAZ    EAAU           YES- FOR ALU OUTPUT                 S03 03708
010237 010517 R
010240 144345 A 3760        SUB    EADA           C ?                                 S03 03709
010241 001010 A 3761        JAZ    EASC           YES- FOR SHIFT COUNTER              S03 03710
010242 010526 R
010243 006140 A 3762        SUBI   6              I ?                                 S03 03711
010244 000006 A
010245 001010 A 3763        JAZ    EAIR           YES- INST REG #1                    S03 03712
010246 010535 R
010247 005311 A 3764        DAR                   J ?                                 S03 03713
010250 001010 A 3765        JAZ    EAJR           YES-JUMP STACK                      S03 03714
010251 010300 R
010252 005311 A 3766        DAR                   K ?                                 S03 03715
010253 001010 A 3767        JAZ    EAKR           YES- FOR DATA LOOP KEY REG          S03 03716
010254 010544 R
010255 144330 A 3768        SUB    EADA           M ?                                 S03 03717
010256 001010 A 3769        JAZ    EAML           YES- MEMORY LATCH                   S03 03718
010257 010553 R
010260 144325 A 3770        SUB    EADA           D ?                                 S03 03719
010261 001010 A 3771        JAZ    EAOR           YES- FOR OPERAND REG                S03 03720
010262 010562 R
010263 006140 A 3772        SUBI   1              P ?                                 S03 03721
010264 000001 A
010265 001010 A 3773        JAZ    EAPR           YES- FOR PROGRAM COUNTER            S03 03722
010266 010304 R
010267 144316 A 3774        SUB    EADA           R ?                                 S03 03723
010270 001010 A 3775        JAZ    EAFR           YES- FOR FILE REGISTERS             S03 03724
010271 010313 R
010272 006140 A 3776        SUBI   1              S ?                                 S03 03725
010273 000001 A
010274 001010 A 3777        JAZ    EASR           YES- FOR STATUS REGISTERS           S03 03726
010275 010571 R
010276 001000 A 3778        JMP    EXC90          ILLEGAL REG SPECIFIED               S03 03727
010277 001147 R
                3779 *                                                                S03 03728
010300 005311 A 3780 EAJR   DAR                                                       S03 03729
010301 054047 A 3781        STA    JRFL           SET JUMP STACK FLAG                 S03 03730
010302 001000 A 3782        JMP    EAFR+1         USE FILE REGISTER ROUTINE           S03 03731
010303 010314 R
                3783 *                                                                S03 03732
                3784 *    ALTER/DISPLAY PROGRAM COUNTER                               S03 03733
010304 006030 A 3785 EAPR   LDXI   DROM+PREG      ADDR OF PREG                        S03 03734
010305 000610 R
010306 025000 A 3786        LDB    0,1                                                S03 03735
010307 002000 A 3787        CALL   EADS           TYPE CONTENTS                       S03 03736
010310 010352 R
010311 001000 A 3788        JMP    EACH           CHANGE IT AND/OR EXIT               S03 03737
010312 010365 R
                3789 *                                                                S03 03738
                3790 *                                                                S03 03739
                3791 *    ALTER/DISPLAY FILE REGISTERS                                S03 03740
010313 054035 A 3792 EAFR   STA    JRFL           CLEAR JUMP STACK FLAG               S03 03741
010314 002000 A 3793        JMPM   FETCHA         GET REG NUMBER 0-F                  S03 03742
010315 015644 R
010316 001010 A 3794        JAZ    EXC90                                              S03 03743
010317 001147 R
010320 002000 A 3795        JMPM   CONV           CONVERT CHAR TO HEX                 S03 03744
010321 012732 R
010322 001002 A 3796        JAP    EAF0           JUMP IF LEGAL HEX CHAR              S03 03745
010323 010326 R
010324 001000 A 3797        JMP    EXC90          OUTPUT ERROR MESSAGE                S03 03746
010325 001147 R
010326 054255 A 3798 EAF0   STA    E108           SAVE REGISTER VALUE                 S03 03747
                3799 *                                                                S03 03748
010327 014254 A 3800 E102   LDA    E108           REGISTER NUMBER                     S03 03749
010330 005012 A 3801        TAB                                                       S03 03750
010331 014017 A 3802        LDA    JRFL           JUMP STACK FLAG                     S03 03751
010332 001004 A 3803        JAN    EAJS           SET ?                               S03 03752
010333 010344 R
010334 005021 A 3804        TBA                   NO                                  S03 03753
010335 124244 A 3805        ADD    E106           ADDR OF PSEUDO REGS                 S03 03754
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010336 005014 A 3806 EAF1   TAX                    REG LOCATION                                  S03 03755
010337 025000 A 3807        LDB     0,1            REG CONTENTS                                  S03 03756
010340 002000 A 3808        CALL    EADS           PRINT CONTENTS                                S03 03757
010341 010352 R
010342 001000 A 3809        JMP     EACH           CHANGE IT AND/OR EXIT                         S03 03758
010343 010365 R
010344 005021 A 3810 EAJS   TBA                                                                  S03 03759
010345 006120 A 3811        ADDI    STACK          ADDR OF STACK                                 S03 03760
010346 000506 R
010347 001000 A 3812        JMP     EAF1                                                         S03 03761
010350 010336 R
010351 000000 A 3813 JRFL   DATA    0              JUMP STACK FLAG                               S03 03762
               3814 *    OUTPUT CONTENTS OF B REG TO TTY PRINTER AS 4 HEX CHAR'S                S03 03763
               3815 *                                                                           S03 03764
010352 000000 A 3816 EADS   ENTR                                                                 S03 03765
010353 074224 A 3817        STX     E104           SAVE REG. LOC.                                S03 03766
010354 034226 A 3818        LDX     E107           ASCII STORAGE BUFR                            S03 03767
010355 002000 A 3819        CALL    DH             CONVERT TO ASCII                              S03 03768
010356 014514 R
010357 002000 A 3820 EADS1  CALL    SIOUT,5,BUFR   OUTPUT CONTENTS                               S03 03769
010360 015406 R
010361 000005 A
010362 000200 R
010363 001000 A 3821        RETU*   EADS                                                         S03 03770
010364 110352 R
               3822 *                                                                           S03 03771
               3823 *                                                                           S03 03772
010365 002000 A 3824 EACH   JMPM    INA            INPUT 1 - 4 HEX DIGITS                        S03 03773
010366 013364 R
010367 151240 A 3825        DATA    'R'                                                          S03 03774
010370 074214 A 3826        STX     E109           SAVE LAST CHAR INPUT                          S03 03775
010371 001020 A 3827        JBZ     EAC1           JUMP IF NO CHANGE VALUE INPUT                 S03 03776
010372 010402 R
010373 034204 A 3828        LDX     E104           REG.LOC.                                      S03 03777
010374 055000 A 3829        STA     0,1                                                          S03 03778
010375 014203 A 3830        LDA     E105           REGISTER                              D       03 03779
010376 006140 A 3831        SUBI    '$'                                                  D       03 03780
010377 000323 A
010400 001010 A 3832        JAZ     SETMUX         SET TMUX IF STATUS REG CHANGE         D       03 03781
010401 010434 R
               3833 *                                                                           S03 03782
010402 014202 A 3834 EAC1   LDA     E109           LAST CHAR INPUT                               S03 03783
010403 006140 A 3835        SUBI    0254           COMMA ?                                       S03 03784
010404 000254 A
010405 001010 A 3836        JAZ     *+4            YES-                                          S03 03785
010406 010411 R
010407 001000 A 3837        JMP     EXC10          NO-RTN TO EXEC                                S03 03786
010410 001111 R
010411 014167 A 3838        LDA     E105           WAS REGISTOR                                  S03 03787
010412 006140 A 3839        SUBI    0312           INPUT J ?                                     S03 03788
010413 000312 A
010414 001010 A 3840        JAZ     EAC2           YES                                           S03 03789
010415 010462 R
010416 006140 A 3841        SUBI    010            INPUT R ?                                     S03 03790
010417 000010 A
010420 001010 A 3842        JAZ     EAC2           YES                                           S03 03791
010421 010462 R
010422 002000 A 3843        CALL    SIOUT,2,ABEL     OUTPUT 'A-BELL'                             S03 03792
010423 015406 R
010424 000002 A
010425 010460 R
010426 002000 A 3844        CALL    SIIN           INPUT REGISTER                                S03 03793
010427 015220 R
010430 002000 A 3845        JMPM    FETCH          GET FIRST CHAR                                S03 03794
010431 015635 R
010432 001000 A 3846        JMP     E100+6                                                       S03 03795
010433 010233 R
010434 006010 A 3847 SETMUX LDAI    0              STATUS WORD VALUE                           E.2********
010435 000000 A
010436 005002 A 3848        TZB                                                                 E.2********
010437 004447 A 3849        LLRL    7                                                           E.2********
010440 006030 A 3850        LDXI    4              SET FOLLOWING TEST CONDITIONS                E.2********
010441 000004 A
010442 006065 A 3851 SETM1  STBE    TMUX+5,1               ALUZ                                 E.2********
010443 000646 R
010444 005002 A 3852        TZB                            ALUC                                 E.2********
010445 005344 A 3853        DXR                            ALUS                                 E.2********
010446 001040 A 3854        JXZ     SETM3                  ALUO                                 E.2********
010447 010453 R
010450 004441 A 3855        LLRL    1                                                           E.2********
010451 001000 A 3856        JMP     SETM1                                                       E.2********
010452 010442 R
010453 004446 A 3857 SETM3  LLRL    6              POSITION TO OVFL BIT                         E.2********
010454 006067 A 3858        STBE    TMUX                                                        E.2********
010455 000641 R
010456 001000 A 3859        JMP     EAC1                                                        E.2********
010457 010402 R
               3860 *                                                                           S03 03803
010460 120240 A 3861 ABEL   DATA    '  A '                                                       S03 03804
010461 140640 A
               3862 *    OUTPUT NEXT FILE REGISTER                                              S03 03805
010462 044121 A 3863 EAC2   INR     E108           FILE REG NUMBER(0-F)                          S03 03806
010463 014120 A 3864        LDA     E108                                                        S03 03807
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010464 006140 A 3865          SUBI    020                                          S03 03808
010465 000020 A
010466 001004 A 3866          JAN     *+4             JUMP IF IN RANGE0-16         S03 03809
010467 010472 R
010470 001000 A 3867          JMP     EXC10           RETURN TO EXEC               S03 03810
010471 001111 R
010472 006010 A 3868          LDAI    0120240         BLANK-BLANK                  S03 03811
010473 120240 A
010474 054016 A 3869          STA     EA3                                          S03 03812
010475 024106 A 3870          LDB     E108            REG NUMBER                   S03 03813
010476 004054 A 3871          LRLB    12              POSITION VALUE               S03 03814
010477 002000 A 3872          JMPM    0H2             CONVERT CHAR TO ASCII        S03 03815
010500 014541 R
010501 004250 A 3873          LRLA    8                                            S03 03816
010502 006110 A 3874          ORAI    0207            MASK IN BEL                  S03 03817
010503 000207 A
010504 054007 A 3875          STA     EA3+1                                        S03 03818
010505 002000 A 3876          CALL    SIOUT,2,EA3                                  S03 03819
010506 015406 R
010507 000002 A
010510 010513 R
010511 001000 A 3877          JMP     E102            GO TYPE CONTENTS             S03 03820
010512 010327 R
               3878 *                                                             S03 03821
010513         3879 EA3       BSS     2                                          S03 03822
010515 001000 A 3880          JMP     E102            GO TYPE CONTENTS             S03 03823
010516 010327 R
               3881 *   ALTER/DISPLAY ALU OUTPUT                                  S03 03824
010517 006030 A 3882 EAAU     LDXI    DROM+XALU                                    S03 03825
010520 000602 R
010521 025000 A 3883          LDB     0,1                                          S03 03826
010522 002000 A 3884          CALL    EADS            TYPE CONTENTS                S03 03827
010523 010352 R
010524 001000 A 3885          JMP     EACH            CHANGE IT AND/OR EXIT        S03 03828
010525 010365 R
               3886 *   ALTER/DISPLAY SHIFT COUNTER                               S03 03829
010526 006030 A 3887 EASC     LDXI    DROM+SREG                                    S03 03830
010527 000611 R
010530 025000 A 3888          LDB     0,1                                          S03 03831
010531 002000 A 3889          CALL    EADS                                         S03 03832
010532 010352 R
010533 001000 A 3890          JMP     EACH                                         S03 03833
010534 010365 R
               3891 *   ALTER/DISPLAY INST REG #1                                 S03 03834
010535 006030 A 3892 EAIR     LDXI    DROM+IRG1                                    S03 03835
010536 000617 R
010537 025000 A 3893          LDB     0,1                                          S03 03836
010540 002000 A 3894          CALL    EADS                                         S03 03837
010541 010352 R
010542 001000 A 3895          JMP     EACH                                         S03 03838
010543 010365 R
               3896 *   ALTER/DISPLAY DATA LOOP KEY REGISTER                      S03 03839
010544 006030 A 3897 EAKR     LDXI    DROM+KREG                                    S03 03840
010545 000615 R
010546 025000 A 3898          LDB     0,1                                          S03 03841
010547 002000 A 3899          CALL    EADS                                         S03 03842
010550 010352 R
010551 001000 A 3900          JMP     EACH                                         S03 03843
010552 010365 R
               3901 *   ALTER/DISPLAY MEMORY INTERFACE LATCH                      S03 03844
010553 006030 A 3902 EAML     LDXI    DROM+MIL                                     S03 03845
010554 000624 R
010555 025000 A 3903          LDB     0,1                                          S03 03846
010556 002000 A 3904          CALL    EADS                                         S03 03847
010557 010352 R
010560 001000 A 3905          JMP     EACH                                         S03 03848
010561 010365 R
               3906 *   ALTER/DISPLAY OPERAND REGISTER                            S03 03849
010562 006030 A 3907 EAOR     LDXI    DROM+OREG                                    S03 03850
010563 000612 R
010564 025000 A 3908          LDB     0,1                                          S03 03851
010565 002000 A 3909          CALL    EADS                                         S03 03852
010566 010352 R
010567 001000 A 3910          JMP     EACH                                         S03 03853
010570 010365 R
               3911 *   ALTER/DISPLAY STATUS REGISTER                             S03 03854
010571 006030 A 3912 EASR     LDXI    DROM+STUS                                    S03 03855
010572 000607 R
010573 025000 A 3913          LDB     0,1                                          S03 03856
010574 002000 A 3914          CALL    EADS                                         S03 03857
010575 010352 R
010576 001000 A 3915          JMP     EACH                                         S03 03858
010577 010365 R
               3916 *                                                             S03 03859
010600 000000 A 3917 E104     DATA    0               SAVE REG LOC.                S03 03860
010601 000000 A 3918 E105     DATA    0               TEMP STORE FOR INITIAL INPUT S03 03861
010602 000526 R 3919 E106     DATA    R0              ADDR OF PSEUDO REGISTERS     S03 03862
010603 000201 R 3920 E107     DATA    BUFR+1          OUTPUT BUFFER ADDR           S03 03863
010604 000000 A 3921 E108     DATA    0               TEMP STORAGE                 S03 03864
010605 000000 A 3922 E109     DATA    0               LAST INPUT CHAR              S03 03865
010606 000002 A 3923 EADA     DATA    2                                            S03 03866
               3924 *                                                             S03 03867
               3925          EJEC                                                 S03 03868
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                    3926 *                                                                  S03 03869
                    3927 *      CHANGE/DISPLAY MEMORY (IN HEXADECIMAL)                      S03 03870
                    3928 *                                                                  S03 03871
010607              3929 CMEM   BSS     0                                                   S03 03872
010607 002000 A     3930        JMPM    PBUF            INITIALIZE BUFFER                   S03 03873
010610 014575 R
010611 002000 A     3931        JMPM    INA             GET DUMP ADDR                       S03 03874
010612 013364 R
010613 147240 A     3932        DATA    'N'                                                 S03 03875
010614 054045 A     3933        STA     CME3            SAVE ADDR                           S03 03876
010615 034045 A     3934 CME1   LDX     CME4            OUTPUT BUFFER ADDR                  S03 03877
010616 024043 A     3935        LDB     CME3                                                S03 03878
010617 026000 A     3936        LDB     0,2                                                 S03 03879
010620 002000 A     3937        JMPM    DH              CONVERT TO ASCII                    S03 03880
010621 014514 R
010622 002000 A.    3938        CALL    SIOUT,3,BUFR      OUTPUT CONTENTS                   S03 03881
010623 015406 R
010624 000003 A
010625 000200 R
010626 002000 A     3939        JMPM    INA             INPUT CHANGE VALUE                  S03 03882
010627 013364 R
010630 151240 A     3940        DATA    'R'                                                 S03 03883
010631 001020 A     3941        JBZ     CME2            JUMP IF NO CHANGE INPUT             S03 03884
010632 010635 R
010633 024026 A     3942        LDB     CME3                                                S03 03885
010634 056000 A     3943        STA     0,2             STORE CHANGE VALUE                  S03 03886
010635 005041 A     3944 CME2   TXA                                                         S03 03887
010636 006140 A     3945        SUBI    0254            COMMA                               S03 03888
010637 000254 A
010640 001010 A     3946        JAZ     *+4             YES                                 S03 03889
010641 010644 R
010642 001000 A     3947        JMP     EXC10           NO-RETURN TO EXEC                   S03 03890
010643 001111 R
010644 002000 A     3948        JMPM    PBUF            INITIALIZE BUFFER                   S03 03891
010645 014575 R
010646 044013 A     3949        INR     CME3            INCR MEMORY ADDR                    S03 03892
010647 024012 A     3950        LDB     CME3            ADDR                                S03 03893
010650 034012 A     3951        LDX     CME4            OUTPUT BUFFER ADDR                  S03 03894
010651 002000 A     3952        JMPM    DH              CONVERT TO ASCII                    S03 03895
010652 014514 R
010653 002000 A     3953        CALL    SIOUT,3,BUFR      OUTPUT ADDR                       S03 03896
010654 015406 R
010655 000003 A
010656 000200 R
010657 014002 A     3954        LDA     CME3                                                S03 03897
010660 001000 A     3955        JMP     CME1            GO OUTPUT CONTENTS                  S03 03898
010661 010615 R
010662 000000 A     3956 CME3   DATA    0               MEMORY ADDRESS                      S03 03899
010663 000201 R     3957 CME4   DATA    BUFR+1          OUTPUT BUFFER                       S03 03900
                    3958        EJEC                                                        S03 03901
                    3959 *                                                                  S03 03902
                    3960 *      LOAD CONTROL STORE, CENTRAL OR DECODE                       S03 03903
                    3961 *      ENTERED VIA THE L COMMAND                                   S03 03904
                    3962 *                                                                  S03 03905
010664              3963 LDRM   BSS     0                                                   S03 03906
010664 002000 A     3964        JMPM    FETCHA          GET WHICH TYPE CONTROL STORE        S03 03907
010665 015644 R
010666 054577 A     3965        STA     LDCTL           SAVE LOAD TYPE                    F ********
010667 001010 A     3966        JAZ     EXC90           ERROR IF NO TYPE SPECIFIED          S03 03908
010670 001147 R
010671 006140 A     3967        SUBI    0303            C ?                                 S03 03909
010672 000303 A
010673 001010 A     3968        JAZ     LDCS            LOADING CENTRAL                     S03 03910
010674 010723 R
010675 005311 A     3969        DAR                     D ?                                 S03 03911
010676 001010 A     3970        JAZ     LDDS            LOADING DECODE                      S03 03912
010677 010706 R
010700 006140 A     3971        SUBI    'M'-'D'         LOADING MAIN MEMORY               F ********
010701 000011 A
010702 001010 A     3972        JAZ     LDMM                                              F ********
010703 010746 R
010704 001000 A     3973        JMP     EXC90           ERROR-ILLEGAL DESIGNATOR            S03 03913
010705 001147 R
010706 002000 A     3974 LDDS   JMPM    FETCHA          GET WHICH DECODE                    S03 03914
010707 015644 R
010710 001010 A     3975        JAZ     EXC90           ERROR IF NO TYPE SEPCIFIED          S03 03915
010711 001147 R
010712 006140 A     3976        SUBI    0301            A?                                  S03 03916
010713 000301 A
010714 001010 A     3977        JAZ     LDDSA                                               S03 03917
010715 010732 R
010716 005311 A     3978        DAR                     B?                                  S03 03918
010717 001010 A     3979        JAZ     LDDSB                                               S03 03919
010720 010737 R
010721 001000 A     3980        JMP     EXC90           ERROR-ILLEGAL DESIGNATOR            S03 03920
010722 001147 R
010723 006020 A     3981 LDCS   LDBI    DBUF                                                S03 03921
010724 000371 R
010725 026000 A     3982        LDB     0,2             ADDR OF CURRENT CCS PAGE            S03 03922
010726 005001 A     3983        TZA                                                         S03 03923
010727 054647 A     3984        STA     LCCS            SET FOR CCS LOAD                    S03 03924
010730 001000 A     3985        JMP     LDRC            START LOAD                          S03 03925
010731 010744 R
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010732 006020 A 3986 LDDSA  LDBI    DRM2          DCSA                                  $03 03926
010733 000373 R
010734 026000 A 3987        LDB     0,2           ADDR OF CURRENT DCSA PAGE             $03 03927
010735 001000 A 3988        JMP     LDRC-2        START LOAD                            $03 03928
010736 010742 R
010737 006020 A 3989 LDDSB  LDBI    DRM1          DCSB                                  $03 03929
010740 000372 R
010741 026000 A 3990        LDB     0,2           ADDR OF CURRENT DCSB PAGE             $03 03930
010742 005301 A 3991        DECR    01                                                  $03 03931
010743 054633 A 3992        STA     LCCS          SET FOR DCS LOAD                      $03 03932
010744        3993 LDRC     BSS     0             START LOAD                            $03 03933
010744 064634 A 3994        STB     LDPT          SAVE POINTER                          $03 03934
010745 064632 A 3995        STB     LDADR         DEFAULT ORG TO 0                    C 03 03935
       010746 R 3996 LDMM   EQU     *                                                 F ********
010746 006027 A 3997        LDBE    SYST          SYSTEM FLAG                           $03 03936
010747 001401 R
010750 016000 A 3998        LDA     0,2                                                 $03 03937
010751 001004 A 3999        JAN     LMOS          JUMP IF MOS                           $03 03938
010752 010763 R
010753 014555 A 4000        LDA     BIFLG                                               $03 03939
010754 001002 A 4001        JAP     LMOS          JUMP IF ON NONE RMD                   $03 03940
010755 010763 R
               4002         IOLINK  6,BUFR+1,120                                        $03 03941
010756 002000 A
010757 000000 E
010760 001406 A
010761 000201 R
010762 000170 A
010763 005001 A 4003 LMOS    TZA                                                         $03 03942
010764 054617 A 4004        STA     RCN           ZERO RECORD NUMBER                    $03 03943
               4005 *                                                                   $03 03944
               4006 *       THE READ FCB/DCB AND WORD COUNT ARE SET AT INITIALIZATION  $03 03945
               4007 *                                                                   $03 03946
               4008 LREAD   READ    BIDCB,6,0,1     READ A RECORD                      $03 03947
010765 002000 A
010766 000312 E
010767 100000 A
010770 010006 A
010771 011563 R
010772 000000 A
010773 000000 A
               4009 LR1     STAT    LREAD,ERR,EOF,BEOD,LR1                            C.1 03 03948
010774 002000 A
010775 000000 E
010776 010765 R
010777 011375 R
011000 011403 R
011001 011411 R
011002 010774 R
011003 005001 A 4010 LREAD1  TZA                                                         $03 03949
011004 054600 A 4011        STA     WDCT          ZERO WORD COUNT                       $03 03950
011005 054567 A 4012        STA     CKSM          CLEAR CHECKSUM SUPPRESS FLAG          $03 03951
011006 054567 A 4013        STA     FREC          CLEAR FIRST RECORD FLAG               $03 03952
011007 054570 A 4014        STA     LREC          CLEAR LAST RECORD FLAG                $03 03953
011010 034557 A 4015        LDX     BIBUF         ADDR OF BI INPUT BUFFER               $03 03954
011011 015000 A 4016        LDA     0,1           GET WORD ZERO                         $03 03955
011012 005012 A 4017        TAB                                                         $03 03956
011013 154557 A 4018        ANA     BIT15         GET BIT 15                            $03 03957
011014 001010 A 4019        JAZ     *+3           JUMP IF NOT SET                       $03 03958
011015 011017 R
011016 044556 A 4020        INR     CKSM          SET CHECKSUM SUPPRESS                 $03 03959
011017 005021 A 4021        TBA                                                         $03 03960
011020 154551 A 4022        ANA     BIT12         GET BIT 12                            $03 03961
011021 001010 A 4023        JAZ     *+4           JUMP IF NOT SET                       $03 03962
011022 011025 R
011023 001000 A 4024        JMP     *+3                                                 $03 03963
011024 011026 R
011025 044553 A 4025        INR     FREC          SET FIRST RECORD FLAG                 $03 03964
011026 005021 A 4026        TBA                                                         $03 03965
011027 154541 A 4027        ANA     BIT11         GET BIT 11                            $03 03966
011030 001010 A 4028        JAZ     *+4           JUMP IF NOT SET                       $03 03967
011031 011034 R
011032 001000 A 4029        JMP     *+3                                                 $03 03968
011033 011037 R
011034 044543 A 4030        INR     LREC          SET LAST RECORD FLAG                  $03 03969
011035 005021 A 4031        TBA                                                         $03 03970
011036 006150 A 4032        ANAI    0377          GET RECORD NUMBER                     $03 03971
011037 000377 A
011040 144543 A 4033        SUB     RCN           SUB EXPECTED RECORD NUMBER            $03 03972
011041 001012 A 4034        JAZ     *+4                                                 $03 03973
011042 011045 R
011043 001000 A 4035        JMP     SEQER         SEQUENCE ERROR                        $03 03974
011044 011417 R
011045 014527 A 4036        LDA     CKSM          CHECKSUM SUPPRESS FLAG                $03 03975
011046 001010 A 4037        JAZ     *+4           FLAG SET                              $03 03976
011047 011052 R
011050 001000 A 4038        JMP     LDFR          YES-DO NOT DO CHECKSUM                $03 03977
011051 011054 R
011052 002000 A 4039        CALL    CKSUM         PERFORM CHECKSUM                      $03 03978
011053 011534 R
011054 014521 A 4040 LDFR    LDA     FREC          FIRST RECORD FLAG                     $03 03979
011055 001010 A 4041        JAZ     LDBP                                                $03 03980
011056 011065 R
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011057 014510 A 4042          LDA     BIBUF     BUFFER ADDR                                  S03 03981
011060 006120 A 4043          ADDI    11        PLUS 11                                      S03 03982
011061 000013 A
011062 054511 A 4044          STA     BUFPTR    MOVED PAST HEADER BLOCK                      S03 03983
011063 001000 A 4045          JMP     LDWD                                                   S03 03984
011064 011071 R
011065 014502 A 4046 LDBP     LDA     BIBUF                                                  S03 03985
011066 006120 A 4047          ADDI    2                                                      S03 03986
011067 000002 A
011070 054503 A 4048          STA     BUFPTR    SET BUFFER POINTER                           S03 03987
011071 014502 A 4049 LDWD     LDA     BUFPTR                                                 S03 03988
011072 144475 A 4050          SUB     BIBUF                                                  S03 03989
011073 006140 A 4051          SUBI    60                                                     S03 03990
011074 000074 A
011075 001002 A 4052          JAP     LDNR      RECORD COMPLETE ?                            S03 03991
011076 011330 R
011077 034474 A 4053          LDX     BUFPTR                                                 S03 03992
011100 014365 A 4054          LDA     LDCTL     LOAD TYPE                                  F  ********
011101 006140 A 4055          SUBI    'M'                                                  F  ********
011102 000315 A
011103 001010 A 4056          JAZ     LDMEM     JUMP IF LOAD MAIN MEMORY                   F  ********
011104 011170 R
011105 015000 A 4057          LDA     0,1       GET WORD                                     S03 03993
011106 005012 A 4058          TAB                                                            S03 03994
011107 004355 A 4059          LSRA    13        GET CODE                                     S03 03995
011110 001010 A 4060          JAZ     *+4                                                    S03 03996
011111 011114 R
011112 001000 A 4061          JMP     *+5                                                    S03 03997
011113 011117 R
011114 044457 A 4062          IAR     BUFPTR    IGNORE THIS WORD                             S03 03998
011115 001000 A 4063          JMP     LDWD                                                   S03 03999
011116 011071 R
011117 005311 A 4064          DAR                                                            S03 04000
011120 001010 A 4065          JAZ     LDORG     SET ORG ADDRESS                              S03 04001
011121 011156 R
011122 005311 A 4066          DAR                                                            S03 04002
011123 001010 A 4067          JAZ     LDST                                                   S03 04003
011124 011127 R
011125 001000 A 4068          JMP     LDCDE     LOADER CODE ERROR                            S03 04004
011126 011425 R
011127         4069 LDST      BSS     0                                                      S03 04005
011127 044444 A 4070          INR     BUFPTR                                                 S03 04006
011130 005021 A 4071          TBA                                                            S03 04007
011131 154451 A 4072          ANA     LSB13     GET 13 LSBS (INST COUNT)                     S03 04008
011132 005111 A 4073          IAR               PLUS ONE AS COUNT IS ACTUAL MINUS ONE        S03 04009
011133 004202 A 4074          ASLA    2         TIMES 4 (FOUR 16 BIT WORDS PER MICRO)        S03 04010
011134 054006 A 4075          STA     NMIC+2    SET COUNT FOR MOVE                           S03 04011
011135 014436 A 4076          LDA     BUFPTR                                                 S03 04012
011136 054005 A 4077          STA     NMIC+3    SET FROM ADDRESS FOR MOVE                    S03 04013
011137 014440 A 4078          LDA     LDADR                                                  S03 04014
011140 054004 A 4079          STA     NMIC+4    SET TO ADDRESS FOR MOVE                      S03 04015
011141 002000 A 4080 NMIC     CALL    MOVW,4,0,0                                             S03 04016
011142 014510 R
011143 000004 A
011144 000000 A
011145 000000 A
011146 017000 I 4081          LDA     NMIC+2    COUNT                                        S03 04017
011147 124424 A 4082          ADD     BUFPTR                                                 S03 04018
011150 054423 A 4083          STA     BUFPTR    UPDATE BUFFER POINTER                        S03 04019
011151 017000 I 4084          LDA     NMIC+2                                                 S03 04020
011152 124425 A 4085          ADD     LDADR                                                  S03 04021
011153 054424 A 4086          STA     LDADR     UPDATE LOAD ADDRESS POINTER                  S03 04022
011154 001000 A 4087          JMP     LDWD                                                   S03 04023
011155 011071 R
               4088 *                                                                        S03 04024
011156 005021 A 4089 LDORG    TBA                                                            S03 04025
011157 154423 A 4090          ANA     LSB13     GET ORG ADDR                                 S03 04026
011160 024416 A 4091          LDB     LCCS                                                   S03 04027
011161 003020 A 4092          XBZ     LDOR1     IF LOADING CCS                               S03 04028
011162 011327 R
011163 124415 A 4093          ADD     LDPT      SET LOAD ADDR                                S03 04029
011164 054413 A 4094          STA     LDADR                                                  S03 04030
011165 044406 A 4095          INR     BUFPTR                                                 S03 04031
011166 001000 A 4096          JMP     LDWD                                                   S03 04032
011167 011071 R
       011170 R 4097 LDMEM    EQU     *         LOAD MAIN MEMORY                           F  ********
011170 015000 A 4098          LDA     0,1       GET WORD                                   F  ********
011171 004355 A 4099          LSRA    13        FETCH LOAD ADDR                            F  ********
011172 005012 A 4100          TAB                                                          F  ********
011173 006016 A 4101          LDAE    CODE,2    CODE SERVICE ADDR                          F  ********
011174 011441 R
011175 001010 A 4102          JAZ     LDCDE     ERROR IF UNSERVICED CODE                   F  ********
011176 011425 R
011177 054115 A 4103          STA     LDSRV+2   SET SERVICE ADDR                           F  ********
011200 002000 A 4104          JMPM    LDSRV     PERFORM SERVICE                            F  ********
011201 011313 R
011202 015000 A 4105          LDA     0,1                                                  F  ********
011203 004351 A 4106          LSRA    9         FETCH SUBCODE                              F  ********
011204 006150 A 4107          ANAI    017                                                  F  ********
011205 000017 A
011206 005012 A 4108          TAB                                                          F  ********
011207 006016 A 4109          LDAE    SCOD,2    SUBCODE SERVICE ADDR                       F  ********
011210 011446 R
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011211 001010 A 4110          JAZ     LDCDE       ERROR IF UNSERVICED SUBCODE                    F ********
011212 011425 R
011213 054101 A 4111          STA     LDSRV+2                                                    F ********
011214 002000 A 4112          JMPM    LDSRV       PERFORM SERVICE                                F ********
011215 011313 R
011216 015000 A 4113          LDA     0,1                                                        F ********
011217 004344 A 4114          LSRA    4           FETCH POINTER                                  F ********
011220 006150 A 4115          ANAI    037                                                        F ********
011221 000037 A
011222 006140 A 4116          SUBI    037                                                        F ********
011223 000037 A
011224 001010 A 4117          JAZ     LDPTR       ONLY ABSOLUTE IS VALID POINTER                 F ********
011225 011230 R
011226 001000 A 4118          JMP     LDCDE       ERROR                                          F ********
011227 011425 R
                4119 *                                                                           F ********
011230 001000 A 4120 LDPTR    JMP     0           ADDRESS SET BY SERVICE ROUTINES                F ********
011231 000000 A
                4121          EJEC                                                               F ********
011232 000000 A 4122 LDLDR    ENTR                CODE+4, LOAD DATA WORDS                        F ********
011233 044340 A 4123          INR     BUFPTR                                                     F ********
011234 015000 A 4124          LDA     0,1                                                        F ********
011235 154345 A 4125          ANA     LSB13       ISOLATE WORD                                   F ********
011236 005111 A 4126          IAR                                                                F ********
011237 054016 A 4127          STA     LDMV+2      SET MOVE COUNT                                 F ********
011240 014333 A 4128          LDA     BUFPTR                                                     F ********
011241 054015 A 4129          STA     LDMV+3      SET FROM  ADDR                                 F ********
011242 124013 A 4130          ADD     LDMV+2                                                     F ********
011243 054330 A 4131          STA     BUFPTR      UPDATE BUFFER POINTER                          F ********
011244 014333 A 4132          LDA     LDADR                                                      F ********
011245 054012 A 4133          STA     LDMV+4      SET TO ADDR                                    F ********
011246 124007 A 4134          ADD     LDMV+2      CALCULATE RANGE                                F ********
011247 054330 A 4135          STA     LDADR       UPDATE LOAD ADDR                               F ********
011250 006140 A 4136          SUBI    EMEM                                                       F ********
011251 000177 R
011252 001002 A 4137          JAP     LDSIZ       ERROR IF MAIN MEMORY EXCEEDED                  F ********
011253 011433 R
011254 002000 A 4138 LDMV     CALL    MOVW,0,0,0  MOVE DATA WORDS TO MEMORY                      F ********
011255 014510 R
011256 000000 A
011257 000000 A
011260 000000 A
011261 001000 A 4139          JMP     LDWD        CONTINUE WITH OBJECT RECORDS                   F ********
011262 011071 R
                4140 *                                                                           F ********
011263 000000 A 4141 LDMDR    ENTR                SET LOAD ADDR                                  F ********
011264 006010 A 4142          LDAI    LDADD                                                      F ********
011265 011274 R
011266 057000 I 4143          STA     LDPTR+1     SET FOR ORG ADDR ROUTINE                       F ********
011267 001000 A 4144          RETU*   LDMDR                                                      F ********
011270 111263 R
                4145 *                                                                           F ********
011271 000000 A 4146 LDMEX    ENTR                SET EXECUTION ADDR                             F ********
011272 001000 A 4147          JMP     LCOM        EXECTION ADDR IS END OF LOAD                   F ********
011273 011367 R
                4148 *                                                                           F ********
        011274 R 4149 LDADD   EQU     *                                                          F ********
011274 044277 A 4150          INR     BUFPTR                                                     F ********
011275 024276 A 4151          LDB     BUFPTR                                                     F ********
011276 016000 A 4152          LDA     0,2         LOAD ADDR                                      F ********
011277 054300 A 4153          STA     LDADR       SET LOAD ADDR                                  F ********
011300 006140 A 4154          SUBI    MMEM                                                       F ********
011301 000000 R
011302 001004 A 4155          JAN     LDSIZ       IF BELOW MAIN MEMORY                           F ********
011303 011433 R
011304 006140 A 4156          SUBI    EMEM-MMEM+1                                                F ********
011305 000200 A
011306 001002 A 4157          JAP     LDSIZ       IF ABOVE MAIN MEMORY                           F ********
011307 011433 R
011310 044263 A 4158          INR     BUFPTR                                                     F ********
011311 001000 A 4159          JMP     LDWD        CONTINUE LOAD                                  F ********
011312 011071 R
                4160 *                                                                           F ********
011313 000000 A 4161 LDSRV    ENTR                                                               F ********
011314 002000 A 4162          JMPM    0           SERVICE LOADER CODE (ADDR SET UPON CALL)       F ********
011315 000000 A
011316 001000 A 4163          RETU*   LDSRV                                                      F ********
011317 111313 R
                4164 *                                                                           F ********
011320 000000 A 4165 LDSCD    ENTR                USE SUBCODE, CODE NOT USED                     F ********
011321 001000 A 4166          RETU*   LDSCD                                                      F ********
011322 111320 R
                4167 *                                                                           F ********
011323 000000 A 4168 LDIGN    ENTR                IGNORE ENTRY                                   F ********
011324 044247 A 4169          INR     BUFPTR      BYPASS WORD                                    F ********
011325 001000 A 4170          JMP     LDWD        CONTINUE LOAD                                  F ********
011326 011071 R
011327 004202 A 4171 LDDR1    ASLA    2           TIMES FOUR                                        S03 04033
011330 014200 A 4172 LDNR     LDA     BIFLG       BI ON RMD FLAG                                    S03 04034
011331 001010 A 4173          JAZ     LDRNS       JUMP IF NOT SET                                   S03 04035
011332 011363 R
011333 006027 A 4174          LDBE    SYST        SYSTEM FLAG                                       S03 04036
011334 001401 R
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011335 016000 A 4175          LDA     0,2                                          S03 04037
011336 001004 A 4176          JAN     LDRNS     MDS SYSTEM                         S03 04038
011337 011363 R
011340 014233 A 4177          LDA     BUFPTR                                       S03 04039
011341 144222 A 4178          SUB     BIDCB+1   BUFFER ADDR                        S03 04040
011342 006140 A 4179          SUBI    120       RECORD LENGTH ON RMD               S03 04041
011343 000170 A
011344 001002 A 4180          JAP     LDRNR     JUMP IF 120 WORDS READ             S03 04042
011345 011360 R
011346 014221 A 4181          LDA     BIBUF                                        S03 04043
011347 006120 A 4182          ADDI    60                                           S03 04044
011350 000074 A
011351 054216 A 4183          STA     BIBUF     SET FOR NEXT 60 WORD BLOCK         S03 04045
011352 044231 A 4184          INR     RCN       ADVANCE RECORD NUMBER              S03 04046
011353 014226 A 4185          LDA     LREC      LAST RECORD FLAG                   S03 04047
011354 001010 A 4186          JAZ     LREAD1    JUMP IF NOT LAST RECORD            S03 04048
011355 011003 R
011356 001000 A 4187          JMP     LCOM      LOAD COMPLETE                      S03 04049
011357 011367 R
011360 014203 A 4188 LDRNR    LDA     BIDCB+1   BUFFER ADDR                        S03 04050
011361 054206 A 4189          STA     BIBUF     RESET BUFFER ADDRESS               S03 04051
011362 054211 A 4190          STA     BUFPTR                                       S03 04052
011363 044220 A 4191 LDRNS    INR     RCN       ADVANCE RECORD NUMBER              S03 04053
011364 014215 A 4192          LDA     LREC      LAST RECORD FLAG                   S03 04054
011365 001010 A 4193          JAZ     LREAD     JUMP IF NOT SET                    S03 04055
011366 010765 R
       011367 R 4194 LCOM     EQU     *                                            S03 04056
011367 002000 A 4195          CALL    SIOUT,8,LDCM    OUTPUT LOAD COMPLETE         S03 04057
011370 015406 R
011371 000010 A
011372 011622 R
011373 001000 A 4196          JMP     EXC10     RETURN                             S03 04058
011374 001111 R
               4197 *                                                             S03 04059
011375 002000 A 4198 ERR      CALL    SIOUT,3,RDER    OUTPUT ERROR                 S03 04060
011376 015406 R
011377 000003 A
011400 011632 R
011401 001000 A 4199          JMP     EXC10                                        S03 04061
011402 001111 R
011403 002000 A 4200 EOF      CALL    SIOUT,3,EOFE    OUTPUT ERROR                 S03 04062
011404 015406 R
011405 000003 A
011406 011611 R
011407 001000 A 4201          JMP     EXC10                                        S03 04063
011410 001111 R
011411 002000 A 4202 BEOD     CALL    SIOUT,3,HOPE    OUTPUT ERROR                 S03 04064
011412 015406 R
011413 000003 A
011414 011614 R
011415 001000 A 4203          JMP     EXC10                                        S03 04065
011416 001111 R
011417 002000 A 4204 SEQER    CALL    SIOUT,3,SEQE    OUTPUT ERROR                 S03 04066
011420 015406 R
011421 000003 A
011422 011635 R
011423 001000 A 4205          JMP     EXC10                                        S03 04067
011424 001111 R
011425 002000 A 4206 LDCDE    CALL    SIOUT,3,LCDE    OUTPUT ERROR                 S03 04068
011426 015406 R
011427 000003 A
011430 011617 R
011431 001000 A 4207          JMP     EXC10                                          S03 04069
011432 001111 R
011433 002000 A 4208 LDSIZ    CALL    SIOUT,3,LSIZ    OUTPUT ERROR                 F  ********
011434 015406 R
011435 000003 A
011436 011640 R
011437 001000 A 4209          JMP     EXC10                                        F  ********
011440 001111 R
               4210 *                                                             F  ********
               4211 * CODE SERVICE ADDR TABLE                                     F  ********
011441 011320 R 4212 CODE     DATA    LDSCD,0,0,0,LDLDR                            F  ********
011442 000000 A
011443 000000 A
011444 000000 A
011445 011232 R
               4213 * SUBCODE SERVICE ADDR TABLE                                  F  ********
011446 011323 R 4214 SCOD     DATA    LDIGN,LDMOR,0,0,0,0,0,LDMEX                  F  ********
011447 011263 R
011450 000000 A
011451 000000 A
011452 000000 A
011453 000000 A
011454 000000 A
011455 011271 R
011456 000000 A 4215          DATA    0,0,0,0,0,0,0,0                              F  ********
011457 000000 A
011460 000000 A
011461 000000 A
011462 000000 A
011463 000000 A
011464 000000 A
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011463 000000 A
                    4216 *                                                                                F  ********
011466 000000 A     4217 LDCTL  DATA    0               LOAD TYPE FLAG                                    F  ********
                    4218 *                                                                                F  ********
                    4220 *                                                                                   $03 04071
                    4221 *      THIS ROUTINE DETERMINES IF THE LOGICAL UNIT IS ON A RMD AND               $03 04072
                    4222 *      VORTEX IS THE OPERATING SYSTEM                                            $03 04073
                    4223 *                                                                                $03 04074
                    4224 *      CALLING SEQUENCE                                                          $03 04075
                    4225 *      CALL    RMD,X           X = LUN                                           $03 04076
                    4226 *      RETURN                  A REG ZERO IF ON RMD AND IN VORTEX                $03 04077
                    4227 *                                                                                $03 04078
011467 000000 A     4228 RMD    ENTR                                                                      $03 04079
011470 027000 I     4229        LDB     RMD                                                               $03 04080
011471 016000 A     4230        LDA     0,2             LUN PARAM OF CALL                                 $03 04081
011472 054010 A     4231        STA     RMD1                                                              $03 04082
011473 047000 I     4232        INR     RMD             UPDATE RETURN ADDRESS                             $03 04083
011474 027000 I     4233        LDB     SYST                                                              $03 04084
011475 016000 A     4234        LDA     0,2             SYSTEM FLAG                                       $03 04085
011476 001004 A     4235        JAN*    RMD             RETURN IF MOS SYSTEM                              $03 04086
011477 111467 R
011500 024025 A     4236        LDB     V$LUT1                                                            $03 04087
011501 016000 A     4237        LDA     0,2                                                               $03 04088
011502 006120 A     4238        ADDI    0                                                                 $03 04089
011503 000000 A
011503              4239 RMD1   BES     0               LUN                                               $03 04090
011504 005014 A     4240        TAX                                                                       $03 04091
011505 015000 A     4241        LDA     0,1             LUN ENTRY                                         $03 04092
011506 157000 I     4242        ANA     RHLF                                                              $03 04093
011507 005311 A     4243        DAR                                                                       $03 04094
011510 054017 A     4244        STA     RMDT                                                              $03 04095
011511 004201 A     4245        ASLA    1                                                                 $03 04096
011512 124015 A     4246        ADD     RMDT                                                              $03 04097
011513 054014 A     4247        STA     RMDT                                                              $03 04098
011514 024012 A     4248        LDB     V$DSTB                                                            $03 04099
011515 016000 A     4249        LDA     0,2                                                               $03 04100
011516 124011 A     4250        ADD     RMDT                                                              $03 04101
011517 005012 A     4251        TAB                                                                       $03 04102
011520 016001 A     4252        LDA     1,2             FIRST WORD OF DST                                 $03 04103
011521 004350 A     4253        LSRA    8               LEFT CHAR                                         $03 04104
011522 006140 A     4254        SUBI    0304            D ?                                               $03 04105
011523 000304 A
011524 001000 A     4255        JMP*    RMD             A REG ZERO IF ON RMD                              $03 04106
011525 111467 R
011526 000400 A     4256 V$LUT1 DATA    0400            LUT POINTER                                       $03 04107
011527 000355 A     4257 V$DSTB DATA    0355            DST POINTER                                       $03 04108
011530 000000 A     4258 RMDT   DATA    0               TEMP STORE                                        $03 04109
011531 000000 A     4259 BIFLG  DATA    0               BI ON RMD FLAG, POS=NO, NEG=YES                   $03 04110
                    4261 *                                                                                $03 04112
                    4262 *      THIS ROUTINE PERFORMS A STANDARD CHECKSUM ON A RECORD                     $03 04113
                    4263 *                                                                                $03 04114
                    4264 *      CALLING SEQUENCE                                                          $03 04115
011532 002000 A     4265        CALL    CKSUM                                                             $03 04116
011533 011534 R
                    4266 *      RETURN  1) TO LOADER IF CHECKSUM OK 2) TO ERROR IF NOT OK                 $03 04117
                    4267 *                                                                                $03 04118
011534 000000 A     4268 CKSUM  ENTR                                                                      $03 04119
011535 006010 A     4269        LDAI    BUFR+1                                                            $03 04120
011536 000201 R
011537 124027 A     4270        ADD     BIBLK+1         RECORD LENGTH                                     $03 04121
011540 054006 A     4271        STA     CKSU2                                                             $03 04122
011541 005002 A     4272        TZB                                                                       $03 04123
011542 005021 A     4273 CKSU1  TBA                                                                       $03 04124
011543 135000 A     4274        ERA     0,1                                                               $03 04125
011544 005012 A     4275        TAB                     SAVE ACCUM VALUE                                  $03 04126
011545 005145 A     4276        INCR    045             A=X=X+1                                           $03 04127
011546 006140 A     4277        SUBI    0                                                                 $03 04128
011547 000000 A
011547              4278 CKSU2  BES     0                                                                 $03 04129
011550 001004 A     4279        JAN     CKSU1           JUMP IF NOT AT END OF RECORD                      $03 04130
011551 011542 R
011552 005021 A     4280        TBA                                                                       $03 04131
011553 001010 A     4281        JAZ*    CKSUM           RETURN IF CHECKSUM OK                             $03 04132
011554 111534 R
011555 002000 A     4282        CALL    SIOUT,3,CKSU    OUTPUT ERROR                                      $03 04133
011556 015406 R
011557 000003 A
011560 011606 R
011561 001000 A     4283        JMP     EXC10           RETURN                                            $03 04134
011562 001111 R
                    4284 *                                                                                $03 04135
                    4285 *      DATA BLOCKS AND TEMPORARY STORAGE                                         $03 04136
                    4286 *                                                                                $03 04137
                    4287 BIDCB  DCB     60,BUFR+1,0     LOCAL DCB FOR BI                                  $03 04138
011563 000074 A
011564 000201 R
011565 000000 A
                    4288        EXT     BIFCB                                                             $03 04139
011566 000335 E     4289 BIBLK  DATA    BIFCB           FCB/DCB ADDR, SET BY INITIALIZATION               $03 04140
011567 000074 A     4290        DATA    60              RECORD LENGTH, SET BY INITIALIZATION              $03 04141
011570 000201 R     4291 BIBUF  DATA    BUFR+1          POINTER TO BUFFER                                 $03 04142
011571 004000 A     4292 BIT11  DATA    04000           BIT 11 MASK                                       $03 04143
011572 010000 A     4293 BIT12  DATA    010000          BIT 12 MASK                                       $03 04144
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011573 100000 A 4294 BIT15   DATA    0100000       BIT 15 MASK                                  S03 04145
011574 000201 R 4295 BUFPTR  DATA    BUFR+1        BUFFER POINTER                               S03 04146
011575 000000 A 4296 CKSM    DATA    0             CHECKSUM FLAG                                S03 04147
011576 000000 A 4297 FREC    DATA    0             FIRST RECORD FLAG                            S03 04148
011577 000000 A 4298 LCCS    DATA    0             LOAD CCS=0 OR DCS=NEG                        S03 04149
011600 000000 A 4299 LDADR   DATA    0             LOAD ADDR                                    S03 04150
011601 000000 A 4300 LDPT    DATA    0             BASE ADDR                                    S03 04151
011602 000000 A 4301 LREC    DATA    0             LAST RECORD FLAG                             S03 04152
011603 017777 A 4302 LSB13   DATA    017777        ADDR BITS                                    S03 04153
011604 000000 A 4303 RCN     DATA    0             CURRENT EXPECTED RECORD NUMBER               S03 04154
011605 000000 A 4304 WDCT    DATA    0             WORD COUNT                                   S03 04155
011606 120240 A 4305 CKSU    DATA    '  MS12'      CHECKSUM ERROR                               S03 04156
011607 146723 A
011610 130662 A
011611 120240 A 4306 EOFE    DATA    '  MS08'      EOF ENCOUNTERED                              S03 04157
011612 146723 A
011613 130270 A
011614 120240 A 4307 HOPE    DATA    '  MS09'      END OF DEVICE                                S03 04158
011615 146723 A
011616 130271 A
011617 120240 A 4308 LCDE    DATA    '  MS11'      LOADER CODE                                  S03 04159
011620 146723 A
011621 130661 A
011622 120240 A 4309 LDCM    DATA    '  LOAD COMPLETE '                                          S03 04160
011623 146317 A
011624 140704 A
011625 120303 A
011626 147715 A
011627 150314 A
011630 142724 A
011631 142640 A
011632 120240 A 4310 RDER    DATA    '  MS07'      READ ERROR                                   S03 04161
011633 146723 A
011634 130267 A
011635 120240 A 4311 SEQE    DATA    '  MS10'      SEQUENCE ERROR                               S03 04162
011636 146723 A
011637 130660 A
011640 120240 A 4312 LSIZ    DATA    '  MS15'      MAIN MEMORY SIZE VIOLATED                F   ********
011641 146723 A
011642 130665 A
                4313         EJEC                                                             S03 04163
                4314 *                                                                        S03 04164
                4315 *       CHANGE/DISPLAY ROM DATA WORD                                     S03 04165
                4316 *                                                                        S03 04166
011643          4317 E110    BSS     0                                                        S03 04167
011643 002000 A 4318         JMPM    INA           GET DUMP ADDR                              S03 04168
011644 013364 R
011645 147240 A 4319         DATA    'M'                                                       03 04169
011646 054107 A 4320         STA     E119          SAVE ADDR                                  S03 04170
011647 006140 A 4321         SUBI    512           ROM BUFFER LIMIT                           S03 04171
011650 001000 A
011651 001002 A 4322         JAP     EXC90         INVALID ADDRESS                            S03 04172
011652 001147 R
                4323 *                                                                        S03 04173
011653 014102 A 4324 E112    LDA     E119          ROM ADDR                                   S03 04174
011654 004242 A 4325         LRLA    2             TIMES FOUR                                 S03 04175
011655 127000 I 4326         ADD*    E116          PLUS CCS BUFFER ADDRESS                    S03 04176
011656 054042 A 4327         STA     E113          SAVE ADDR                                  S03 04177
                4328 *                                                                        S03 04178
011657 002000 A 4329         JMPM    PBUF          SETUP PRINTER BUFFER                       S03 04179
011660 014575 R
011661 034072 A 4330         LDX     E117          ASCII BUFFER ADDR                          S03 04180
011662 024036 A 4331         LDB     E113          ROM ADDR                                   S03 04181
011663 026000 A 4332         LDB     0,2           FIRST 16-BIT DATA BLOCK                    S03 04182
011664 002000 A 4333         JMPM    DH            CONVERT HEX TO ASCII                       S03 04183
011665 014514 R
                4334 *                                                                        S03 04184
011666 024032 A 4335         LDB     E113          ROM ADDR                                   S03 04185
011667 026001 A 4336         LDB     1,2           SECOND 16-BIT DATA BLOCK                   S03 04186
011670 002000 A 4337         JMPM    DH            CONVERT DATA TO ASCII                      S03 04187
011671 014514 R
                4338 *                                                                        S03 04188
011672 024026 A 4339         LDB     E113          ROM ADDR                                   S03 04189
011673 026002 A 4340         LDB     2,2           THIRD 16-BIT DATA BLOCK                    S03 04190
011674 002000 A 4341         JMPM    DH            CONVERT DATA TO ASCII                      S03 04191
011675 014514 R
                4342 *                                                                        S03 04192
011676 024022 A 4343         LDB     E113          ROM ADDR                                   S03 04193
011677 026003 A 4344         LDB     3,2           FOURTH 16-BIT DATA BLOCK                   S03 04194
011700 002000 A 4345         JMPM    DH            CONVERT DATA TO ASCII                      S03 04195
011701 014514 R
                4346 *                                                                        S03 04196
011702 002000 A 4347         CALL    $IOUT,11,BUFR   OUTPUT TO SO                             S03 04197
011703 015406 R
011704 000013 A
011705 000200 R
                4348 *                                                                        S03 04198
011706 002000 A 4349         JMPM    INH           INPUT CHANGE VALUE - IF ANY                S03 04199
011707 013464 R
011710 001040 A 4350         JXZ     EXC10                                                    S03 04200
011711 001111 R
011712 074042 A 4351         STX     E118          LAST INPUT CHAR                            S03 04201
011713 001020 A 4352         JBZ     E114          JUMP IF NO CHANGE VALUE INPUT              S03 04202
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011714 011722 R
011715 002000 A 4353          JMPM    MOVW          MOVE DATA TO ROM BUFFER                    S03 04203
011716 014510 R
011717 000004 A 4354          DATA    4             WORD COUNT                                 S03 04204
011720 000476 R 4355          DATA    V             FROM ADDR                                  S03 04205
011721 000000 A 4356 E113     DATA    0             TO ADDR                                    S03 04206
                4357 *                                                                         S03 04207
011722 014032 A 4358 E114     LDA     E118          LAST INPUT CHAR                            S03 04208
011723 006140 A 4359          SUBI    0254          COMMA                                      S03 04209
011724 000254 A
011725 001010 A 4360          JAZ     *+4           YES - DISPLAY NEXT WORD                    S03 04210
011726 011731 R
011727 001000 A 4361          JMP     EXC10         NO - RETURN TO EXEC                        S03 04211
011730 001111 R
       011731 R 4362 E114A    EQU     *                                                      F  ********
011731 044024 A 4363          INR     E119          STEP ROM RELATIVE ADDR                     S03 04212
011732 014023 A 4364          LDA     E119                                                     S03 04213
011733 006140 A 4365          SUBI    512           ROM BUFFER LIMIT                           S03 04214
011734 001000 A
011735 001010 A 4366          JAZ     EXC10         RETURN - AT END OF BUFFER                  S03 04215
011736 001111 R
011737 002000 A 4367 E115     JMPM    PBUF          INITIALIZE LD BUFFER                       S03 04216
011740 014575 R
011741 034012 A 4368          LDX     E117          BUFFER ADDR                                S03 04217
011742 024013 A 4369          LDB     E119          ROM ADDR                                   S03 04218
011743 002000 A 4370          JMPM    DH            CONVERT TO ASCII                           S03 04219
011744 014514 R
011745 002000 A 4371          CALL    SIOUT,4,BUFR    OUTPUT TO SD                             S03 04220
011746 015406 R
011747 000004 A
011750 000200 R
011751 001000 A 4372          JMP     E112          OUTPUT CONTENTS OF WORD                    S03 04221
011752 011653 R
                4373 *                                                                         S03 04222
                4374 *                                                                         S03 04223
011753 000371 R 4375 E116     DATA    DBUF          ROM ADDR                                   S03 04224
011754 000201 R 4376 E117     DATA    BUFR+1        OUTPUT BUFFER ADDR                         S03 04225
011755 000000 A 4377 E118     DATA    0             LAST INPUT CHAR                            S03 04226
011756 000000 A 4378 E119     DATA    0             TEMP STORED ROM ADDR                       S03 04227
                4379          EJEC                                                           S03 04228
                4380 *                                                                         S03 04229
                4381 *        ROM ADDRESS HALT                                               S03 04230
                4382 *                                                                         S03 04231
011757                  4383 E120     BSS     0                                              S03 04232
011757 014036 A 4384          LDA     E122                                                   S03 04233
011760 006127 A 4385          ADRE    CPAG          SELECTED PAGE                          C 03 04234
011761 000503 R
011762 005012 A 4386          TAB                                                          C 03 04235
011763 016000 A 4387          LDA     0,2           PAGE HALT TABLE                        C 03 04236
011764 054021 A 4388          STA     E123          STUFF INTO SUBTRACTION                 C 03 04237
011765 054087 A 4389          STA     E121          RESET HALT BUFFER POINTER                S03 04238
011766 002000 A 4390 E124     JMPM    INA           GET HALT ADDRESS                       C 03 04239
011767 013364 R
011770 147240 A 4391          DATA    'N'                                                    S03 04240
011771 024023 A 4392          LDB     E121                                                   S03 04241
011772 056000 A 4393          STA     0,2           SET HALT ADDR                            S03 04242
011773 005041 A 4394          TXA                                                            S03 04243
011774 006140 A 4395          SUBI    0254          COMMA                                    S03 04244
011775 000254 A
011776 001010 A 4396          JAZ     *+4           YES                                      S03 04245
011777 012002 R
012000 001000 A 4397          JMP     EXC10         RETURN                                   S03 04246
012001 001111 R
012002 005122 A 4398          IBR                   ADVANCE POINTER                          S03 04247
012003 064011 A 4399          STB     E121                                                   S03 04248
012004 005021 A 4400          TBA                                                            S03 04249
012005 006140 A 4401          SUBI    RHLT0                                                C 03 04250
012006 000445 R
012006                  4402 E123     BES     0             OVERLAYED BY ABOVE STORE       C 03 04251
012007 006140 A 4403          SUBI    5             FIVE ALREADY INPUT ?                     S03 04252
012010 000005 A
012011 001004 A 4404          JAN     E124          NO-LOOK FOR MORE                       C 03 04253
012012 011766 R
012013 001000 A 4405          JMP     EXC10         YES-RETURN                               S03 04254
012014 001111 R
012015 000441 R 4406 E121     DATA    RHLT                                                   S03 04255
012016 000441 R 4407 E122     DATA    RHLT                                                   S03 04256
                4408          EJEC                                                           S03 04257
                4409 *                                                                         S03 04258
                4410 *        SINGLE MICRO INSTRUCTION                                       S03 04259
                4411 *                                                                         S03 04260
012017                  4412 E130     BSS     0                                              S03 04261
012017 002000 A 4413          JMPM    FETCHA        GET MODE FLAG                            S03 04262
012020 015644 R
012021 001010 A 4414          JAZ     EXC90                                                  S03 04263
012022 001147 R
012023 005002 A 4415          TZB                   RUN MODE FLAG                            S03 04264
012024 006140 A 4416          SUBI    0322          R ?                                      S03 04265
012025 000322 A
012026 001010 A 4417          JAZ     E131          JUMP IF RUN MODE                         S03 04266
012027 012036 R
012030 005122 A 4418          IBR                   STEP MODE FLAG                           S03 04267
012031 005311 A 4419          DAR                   0323  ASCII S                           S03 04268
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012032 001010 A 4420          JAZ     E131        JUMP IF STEP MODE                          S03 04269
012033 012036 R
012034 001000 A 4421          JMP     EXC90       INCORRECT INPUT                            S03 04270
012035 001147 R
                4422 *                                                                       S03 04271
012036 034020 A 4423 E131     LDX     E132                                                   S03 04272
012037 065000 A 4424          STB     0,1         SET STEP/RUN MODE FLAG                     S03 04273
012040 002000 A 4425          JMPM    INA         LOOK FOR RUN COUNT                         S03 04274
012041 013364 R
012042 147240 A 4426          DATA    'N'                                                    S03 04275
012043 001020 A 4427          JBZ     E133        NO COUNT GIVEN                             S03 04276
012044 012052 R
012045 005311 A 4428          DAR                                                            S03 04277
012046 054011 A 4429          STA     RCNT        SET RUN COUNT                              S03 04278
012047 054055 A 4430          STA     EXLIM       SET EXECUTION LIMIT                    E.2*********
012050 001000 A 4431          JMP     EXC10       RETURN                                     S03 04279
012051 001111 R
012052 005301 A 4432 E133     DECR    01                                                     S03 04280
012053 054004 A 4433          STA     RCNT        SET UNLIMITED RUN COUNT                    S03 04281
012054 054050 A 4434          STA     EXLIM                                              E.2*********
012055 001000 A 4435          JMP     EXC10       RETURN TO EXEC                             S03 04282
012056 001111 R
012057 000471 R 4436 E132     DATA    STEP        STEP/RUN MODE FLAG                         S03 04283
012060 177777 A 4437 RCNT     DATA    -1          RUN COUNT LIMIT                            S03 04284
                4438          EJEC                                                           S03 04285
                4439 *                                                                       S03 04286
                4440 *        TRACE                                                          S03 04287
                4441 *                                                                       S03 04288
012061          4442 E140     BSS     0                                                      S03 04289
012061 002000 A 4443          JMPM    FETCHA      GET SET/RESET INPUT                        S03 04290
012062 015644 R
012063 001010 A 4444          JAZ     EXC90                                                  S03 04291
012064 001147 R
012065 005002 A 4445          TZB                 TRACE OFF FLAG                             S03 04292
012066 006140 A 4446          SUBI    0322        ASCII R                                    S03 04293
012067 000322 A
012070 001010 A 4447          JAZ     E142        JUMP IF TRACE OFF REQUEST                  S03 04294
012071 012100 R
012072 005122 A 4448          IBR                 TRACE ON FLAG                              S03 04295
012073 005311 A 4449          DAR                 ASCII S (0323)                             S03 04296
012074 001010 A 4450          JAZ     E143        JUMP IF TRACE ON REQUEST                   S03 04297
012075 012105 R
012076 001000 A 4451          JMP     EXC90       INCORRECT INPUT                            S03 04298
012077 001147 R
                4452 *                                                                       S03 04299
012100 037000 I 4453 E142     LDX     CPAG                                               D    03 04300
012101 006055 A 4454          STAE    TRACE,1     SET TRACE FLAG OFF FOR PAGE            D    03 04301
012102 000472 R
012103 001000 A 4455          JMP     EXC10       RETURN TO EXEC                             S03 04302
012104 001111 R
012105 002000 A 4456 E143     CALL    E155        GET ADDRESS BOUNDS                         S03 04303
012106 012136 R
012107 037000 I 4457          LDX     CPAG        CURRENT PAGE                           D    03 04304
012110 014102 A 4458          LDA     START                                                  S03 04305
012111 006055 A 4459          STAE    STRTRC,1    SET START TRACE                        D    03 04306
012112 012126 R
012113 014100 A 4460          LDA     END                                                D    03 04307
012114 006055 A 4461          STAE    ENDTRC,1    SET END TRACE                          D    02 04308
012115 012132 R
012116 037000 I 4462          LDX     CPAG                                               D    03 04309
012117 006010 A 4463          LDAI    1                                                      S03 04310
012120 000001 A
012121 006055 A 4464          STAE    TRACE,1     SET TRACE FLAG ON FOR PAGE             D    03 04311
012122 000472 R
012123 001000 A 4465          JMP     EXC10       RETURN                                     S03 04312
012124 001111 R
012125 000000 A 4466 EXLIM    DATA    0           EXECUTION LIMIT                        E.2*********
                4467 *                                                                       S03 04313
012126 000000 A 4468 STRTRC   DATA    0,0,0,0     TRACE START                            D    03 04314
012127 000000 A
012130 000000 A
012131 000000 A
012132 000000 A 4469 ENDTRC   DATA    0,0,0,0     TRACE END                              D    03 04315
012133 000000 A
012134 000000 A
012135 000000 A
                4470 *                                                                       S03 04316
                4471          EJEC                                                           S03 04317
                4472 *                                                                       S03 04318
                4473 *        THIS ROUTINE WILL FETCH BEGIN AND END ADDRESSES              S03 04319
                4474 *        DEFAULT IS EITHER IS MISSING AS FOLLOWS:                     S03 04320
                4475 *                START TO 0                                           S03 04321
                4476 *                END TO 512 (1FF)                                     S03 04322
                4477 *        CALLING SEQUENCE                                             S03 04323
                4478 *        CALL    E155                                                 S03 04324
                4479 *        RETURN  START ADDR IN START, END ADDR IN END                 S03 04325
                4480 *                                                                     S03 04326
012136 000000 A 4481 E155     ENTR                                                         S03 04327
012137 002000 A 4482          JMPM    INA         GET START ADDRESS                        S03 04328
012140 013364 R
012141 147240 A 4483          DATA    'N'                                                  S03 04329
012142 054050 A 4484          STA     START       SAVE ADDRESS                             S03 04330
012143 005041 A 4485          TXA                 LAST CHAR                                S03 04331
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012144 006140 A 4486          SUBI    0254          COMMA                                  S03 04332
012145 000254 A
012146 001010 A 4487          JAZ     *+4           COMMA ?                                S03 04333
012147 012152 R
012150 001020 A 4488          JBZ     E144          NO BOUNDS GIVEN                        S03 04334
012151 012204 R
012152 001020 A 4489          JBZ     *+4           YES-START ADDR GIVEN ?                 S03 04335
012153 012156 R
012154 001000 A 4490          JMP     *+3                                                  S03 04336
012155 012157 R
012156 064034 A 4491          STB     START         DEFAULT START ADDRESS                  S03 04337
012157 017000 I 4492          LDA     CHAR                                                 S03 04338
012160 005311 A 4493          DAR                                                          S03 04339
012161 057000 I 4494          STA     CHAR          RESET CHAR COUNT BACK ONE              S03 04340
012162 002000 A 4495          JMPM    FETCHA        LOOK FOR END TRACE                     S03 04341
012163 015644 R
012164 001010 A 4496          JAZ     E145                                                 S03 04342
012165 012206 R
012166 006140 A 4497          SUBI    0254          COMMA ?                                S03 04343
012167 000254 A
012170 001010 A 4498          JAZ     *+4           YES                                    S03 04344
012171 012174 R
012172 001000 A 4499          JMP     E145          NO END TRACE                           S03 04345
012173 012206 R
012174 002000 A 4500          JMPM    INA           GET END TRACE ADDR                     S03 04346
012175 013364 R
012176 147240 A 4501          DATA    'N'                                                  S03 04347
012177 001020 A 4502          JBZ     E145                                                 S03 04348
012200 012206 R
012201 054012 A 4503          STA     END           SET END ADDRESS                        S03 04349
012202 001000 A 4504          JMP*    E155          RETURN                                 S03 04350
012203 112136 R
012204 005001 A 4505 E144     TZA                                                          S03 04351
012205 054005 A 4506          STA     START         DEFAULT START TO 0                     S03 04352
012206 006010 A 4507 E145     LDAI    0777                                                 S03 04353
012207 000777 A
012210 054003 A 4508          STA     END           DEFAULT END TO 0777 (1FF)              S03 04354
012211 001000 A 4509          JMP*    E155                                                 S03 04355
012212 112136 R
012213 000000 A 4510 START    DATA    0             START ADDR                             S03 04356
012214 000000 A 4511 END      DATA    0             END ADDR                               S03 04357
                4512          EJEC                                                         S03 04358
                4513 *                                                                     S03 04359
                4514 *        DUMP CONTENTS OF ROM BUFFER                                  S03 04360
                4515 *                                                                     S03 04361
012215          4516 E150     BSS     0                                                    S03 04362
012215 002000 A 4517          CALL    E155          GET ADDRESS BOUNDS                     S03 04363
012216 012136 R
012217 017000 I 4518          LDA     START                                                S03 04364
012220 054147 A 4519          STA     E158          SET START DUMP                         S03 04365
012221 006140 A 4520          SUBI    512           BUFFER SIZE                            S03 04366
012222 001000 A
012223 001002 A 4521          JAP     EXC90         INVALID ADDRESS                        S03 04367
012224 001147 R
012225 017000 I 4522          LDA     END                                                  S03 04368
012226 054142 A 4523          STA     E159          SET END DUMP                           S03 04369
012227 006140 A 4524          SUBI    512           BUFFER SIZE                            S03 04370
012230 001000 A
012231 001002 A 4525          JAP     EXC90         INVALID ADDRESS                        S03 04371
012232 001147 R
012233 014135 A 4526          LDA     E159          END ADDRESS                            S03 04372
012234 144133 A 4527          SUB     E158          START ADDRESS                          S03 04373
012235 001002 A 4528          JAP     E152                                                 S03 04374
012236 012241 R
012237 001000 A 4529          JMP     EXC90         INVALID RANGE                          S03 04375
012240 001147 R
                4530 *                                                                     S03 04376
012241 002000 A 4531 E152     CALL    TPFRM         TOP OF FORM                            S03 04377
012242 014760 R
012243 002000 A 4532          CALL    LOOUT,26,E15B   OUTPUT HEADER                      F  ********
012244 015470 R
012245 000032 A
012246 012373 R
012247 006010 A 4533 E15C     LDAI    14            LINE COUNT                             S03 04379
012250 000016 A
012251 054120 A 4534          STA     E15A          SAVE FOR DUMP                          S03 04380
012252 002000 A 4535          JMPM    SPAC          SPACE LO                               S03 04381
012253 014747 R
                4536 *                                                                     S03 04382
                4537 *        DUMP DATA TO LO                                              S03 04383
                4538 *                                                                     S03 04384
012254 002000 A 4539 E153     JMPM    PBUF          SETUP PRINTER BUFFER                   S03 04385
012255 014573 R
012256 034105 A 4540          LDX     E134          OUTPUT BUFFER ADDR                     S03 04386
                4541 *                                                                     S03 04387
012257 024110 A 4542          LDB     E158          START DUMP ADDR                        S03 04388
012260 002000 A 4543          JMPM    DH            CONVERT TO ASCII IN BUFR               S03 04389
012261 014514 R
012262 005144 A 4544          IXR                   SPACES AFTER ADDRESS IN BUFFER         S03 04390
                4545 *                                                                     S03 04391
012263 014104 A 4546          LDA     E158          START DUMP ADDR                        S03 04392
012264 004242 A 4547          LRLA    2             TIMES FOUR                             S03 04393
012265 127000 I 4548          ADD*    E156          PLUS CCS BUFFER ADDRESS                S03 04394
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012266 054100 A 4549          STA     E157    SAVE ROM BUFFER ADDR                        S03 04395
012267 005012 A 4550          TAB                                                         S03 04396
012270 026000 A 4551          LDB     0,2     FIRST 16 BITS OF ROM WORD                   S03 04397
012271 002000 A 4552          JMPM    0H      CONVERT TO ASCII                            S03 04398
012272 014514 R
                    4553 *                                                                S03 04399
012273 024073 A 4554          LDB     E157    ROM ADDR                                    S03 04400
012274 026001 A 4555          LDB     1,2     SECOND 16 BITS OF ROM WORD                  S03 04401
012275 002000 A 4556          JMPM    0H      CONVERT TO ASCII                            S03 04402
012276 014514 R
012277 005144 A 4557          IXR             SPACE AFTER FIRST 8 DIGITS                  S03 04403
                    4558 *                                                                S03 04404
012300 024066 A 4559          LDB     E157    ROM ADDR                                    S03 04405
012301 026002 A 4560          LDB     2,2     THIRD 16 BITS OF ROM WORD                   S03 04406
012302 002000 A 4561          JMPM    0H      CONVERT TO ASCII                            S03 04407
012303 014514 R
                    4562 *                                                                S03 04408
012304 024062 A 4563          LDB     E157    ROM ADDR                                    S03 04409
012305 026003 A 4564          LDB     3,2     FOURTH 16 BITS OF ROM WORD                  S03 04410
012306 002000 A 4565          JMPM    0H      CONVERT TO ASCII                            S03 04411
012307 014514 R
012310 005144 A 4566          IXR             SPACE AFTER HEX WORD IN BUFFER              S03 04412
                    4567 *                                                                S03 04413
012311 024055 A 4568          LDB     E157    ROM ADDR                                    S03 04414
012312 026000 A 4569          LDB     0,2     FIRST 16 BITS OF ROM WORD                   S03 04415
012313 002000 A 4570          JMPM    E160    CONVERT TO ASCII                            S03 04416
012314 012425 R
012315 005144 A 4571          IXR             SPACE                                       S03 04417
                    4572 *                                                                S03 04418
012316 024050 A 4573          LDB     E157    ROM ADDR                                    S03 04419
012317 026001 A 4574          LDB     1,2     SECOND 16 BITS OF ROM WORD                  S03 04420
012320 002000 A 4575          JMPM    E160    CONCERT TO ASCII                            S03 04421
012321 012425 R
                    4576 *                                                                S03 04422
012322 002000 A 4577          CALL    LOOUT,31,BUFR   OUTPUT LINE                       F  ********
012323 015470 R
012324 000037 A
012325 000200 R
012326 002000 A 4578 E15D     JMPM    PBUF    SETUP LO BUFFER                             S03 04432
012327 014575 R
012330 034034 A 4579          LDX     E154+1  BUFFER ADDR                                 S03 04433
012331 024035 A 4580          LDB     E157    ROM ADDR                                    S03 04434
012332 026002 A 4581          LDB     2,2     THIRD 16 BITS OF ROM WORD                   S03 04435
012333 002000 A 4582          JMPM    E160    CONVERT TO ASCII                            S03 04436
012334 012425 R
012335 005144 A 4583          IXR             SPACE                                       S03 04437
                    4584 *                                                                S03 04438
012336 024030 A 4585          LDB     E157    ROM ADDR                                    S03 04439
012337 026003 A 4586          LDB     3,2     FOURTH 16 BITS OF ROM WORD                  S03 04440
012340 002000 A 4587          JMPM    E160    CONVERT TO ASCII                            S03 04441
012341 012425 R
012342 002000 A 4588          CALL    LOOUT,31,BUFR   OUTPUT LINE                       S03 04442
012343 015470 R
012344 000037 A
012345 000200 R
012346 002000 A 4589 E15E     JMPM    SPAC                                                S03 04443
012347 014747 R
012350 044017 A 4590          INR     E158    STEP START DUMP ADDR                        S03 04444
012351 014017 A 4591          LDA     E159    END DUMP ADDR                               S03 04445
012352 144015 A 4592          SUB     E158                                                S03 04446
012353 001004 A 4593          JAN     EXC10   JUMP IF DONE                                S03 04447
012354 001111 R
                    4594 *                                                                S03 04448
                    4595 *                                                                S03 04449
012355 014014 A 4596          LDA     E15A    LINE COUNT                                  S03 04450
012356 005311 A 4597          DAR                                                         S03 04451
012357 054012 A 4598          STA     E15A    DECREMENTED COUNT                           S03 04452
012360 001010 A 4599          JAZ     E152+2  JUMP IF PAGE COMPLETE                       S03 04453
012361 012243 R
012362 001000 A 4600          JMP     E153    OUTPUT NEXT LINE OF PAGE                    S03 04454
012363 012254 R
                    4601 *                                                                S03 04455
012364 000201 R 4602 E154     DATA    BUFR+1  OUTPUT BUFFER ADDR                          S03 04456
012365 000216 R 4603          DATA    BUFR+14 BUFFER ADDR FOR SECOND LINE                 S03 04457
012366 000371 R 4604 E156     DATA    DBUF    ROM ADDR                                    S03 04458
012367 000000 A 4605 E157     DATA    0       ROM WORD LOCATION                           S03 04459
012370 000000 A 4606 E158     DATA    0       START DUMP ADDR                             S03 04460
012371 000000 A 4607 E159     DATA    0       END DUMP ADDR                               S03 04461
012372 000000 A 4608 E15A     DATA    0       LINE COUNT FOR DUMP                         S03 04462
012373 120240 A 4609 E15B     DATA    *   ADD     HEXADECIMAL                 BINARY  *   S03 04463
012374 140704 A
012375 142240 A
012376 120240 A
012377 120240 A
012400 144305 A
012401 154301 A
012402 142305 A
012403 141711 A
012404 146701 A
012405 146240 A
012406 120240 A
012407 120240 A
012410 120240 A
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012411 120240 A
012412 120240 A
012413 120240 A
012414 120240 A
012415 120240 A
012416 120302 A
012417 144716 A
012420 140722 A
012421 154640 A
012422 120240 A
012423 120240 A
012424 120240 A
                    4610          EJEC                                                    S03 04465
                    4611 *                                                                S03 04466
                    4612 *        CONVERT 16 BITS IN B TO ASCII CODED BINARY IN BUFF      S03 04467
                    4613 *                                                                S03 04468
                    4614 *        X CONTAINS ADDR OF STORAGE LOCATION IN BUFR             S03 04469
                    4615 *                                                                S03 04470
012425 000000 A     4616 E160     ENTR                                                    S03 04471
012426 005001 A     4617          TZA                                                     S03 04472
012427 004441 A     4618          LLRL    1       SHIFT FIRST BIT INTO A                  S03 04473
012430 005122 A     4619          IBR             SET TRAILING BIT IN B                   S03 04474
012431 001000 A     4620          JMP     *+6     START CONVERSION                        S03 04475
012432 012437 R
                    4621 *                                                                S03 04476
012433 005001 A     4622 E162     TZA                                                     S03 04477
012434 004441 A     4623          LLRL    1       SHIFT NEXT BIT INTO A                   S03 04478
012435 001020 A     4624          JBZ*    E160    RETURN IF COMPLETE                      S03 04479
012436 112425 R
012437 006120 A     4625          ADDI    0260    CONVERT BIT TO ASCII CHAR               S03 04480
012440 000260 A
012441 004247 A     4626          LRLA    7       LEFT JUSTIFY CHAR - ALMOST              S03 04481
012442 004441 A     4627          LLRL    1       SHIFT NEXT BIT INTO A                   S03 04482
012443 006120 A     4628          ADDI    0260    CONVERT TO ASCII                        S03 04483
012444 000260 A
012445 055000 A     4629          STA     0,1     STORE CHARS IN BUFFER                   S03 04484
012446 005144 A     4630          IXR             STEP BUFFER INDEX                       S03 04485
012447 001000 A     4631          JMP     E162    CONVERT NEXT TWO BITS                   S03 04486
012450 012433 R
                    4632          EJEC                                                    S03 04487
                    4633 *                                                                S03 04488
                    4634 *        RETURN TO OPERATING SYSTEM                              S03 04489
                    4635 *                                                                S03 04490
012451 002000 A     4636 E170     JMPM    FETCHA  CHECK IF REALLY WANT TO RETURN          S03 04491
012452 015644 R
012453 001010 A     4637          JAZ     E171    YES                                     S03 04492
012454 012463 R
012455 006140 A     4638          SUBI    0240    BLANK ?                                 S03 04493
012456 000240 A
012457 001010 A     4639          JAZ     E171    YES, GUESS SO                           S03 04494
012460 012463 R
012461 001000 A     4640          JMP     EXC90   NO, MUST BE AN ERROR                    S03 04495
012462 001147 R
012463 006017 A     4641 E171     LDAE    LOFLG   LD ON RMD FLAG                         S03 04496
012464 015603 R
012465 001002 A     4642          JAP     E172    JUMP IF NO                              S03 04497
012466 012476 R
                    4643          CLOSE   LOFCB,5,0,1  CLOSE AND UPDATE                  S03 04498
012467 002000 A
012470 010766 E
012471 100000 A
012472 013405 A
012473 000334 E
012474 000000 A
012475 000000 A
012476 002000 A     4644 E172     CALL    EXIT    RETURN TO OPERATING SYSTEM              S03 04499
012477 000000 E
012500 001000 A     4645          JMP     EXC     JUST IN CASE                            S03 04500
012501 000716 R
                    4646          EJEC                                                    S03 04501
                    4647 *        THIS ROUTINE HANDLES THE SELECT INPUT MEDIA COMMAND (M) S03 04502
                    4648 *                                                                S03 04503
                    4649 *        'MR' SELECTS SI TO BE THE INPUT MEDIA                   S03 04504
                    4650 *        'MS' SELECTS PI TO BE THE INPUT MEDIA                   S03 04505
                    4651 *                                                                S03 04506
                    4652 *        CALLING SEQUENCE                                        S03 04507
                    4653 *                                                                S03 04508
                    4654 *        JMP     CHME                                            S03 04509
                    4655 *        RETURN  DESIRED INPUT MEDIA SELECTED                    S03 04510
                    4656 *                                                                S03 04511
012502 002000 A     4657 CHME     JMPM    FETCHA  GET SELECTOR INDICATOR                  S03 04512
012503 015644 R
012504 001010 A     4658          JAZ     EXC90                                           S03 04513
012505 001147 R
012506 006140 A     4659          SUBI    0322    R ?                                     S03 04514
012507 000322 A
012510 001010 A     4660          JAZ     CHMR                                            S03 04515
012511 012523 R
012512 005311 A     4661          DAR             S ?                                     S03 04516
012513 001010 A     4662          JAZ     CHMS                                            S03 04517
012514 012517 R
012515 001000 A     4663          JMP     EXC90   INVALID INPUT                           S03 04518
012516 001147 R
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012517 005301 A 4664 CHMS   DECR   01                                          $03 04519
012520 054006 A 4665        STA    MEDIA        SET TO PI INPUT                $03 04520
012521 001000 A 4666        JMP    EXC10                                       $03 04521
012522 001111 R
012523 005001 A 4667 CHMR   TZA                                                $03 04522
012524 054002 A 4668        STA    MEDIA        SET TO SI INPUT                $03 04523
012525 001000 A 4669        JMP    EXC10                                       $03 04524
012526 001111 R
012527 000000 A 4670 MEDIA  DATA   0                                           $03 04525
               4671         EJEC                                             $03 04526
               4672 *                                                        $03 04527
               4673 *    DISPLAY/CHANGE DECODE ROMS(A OR B) WORDS             $03 04528
               4674 *                                                        $03 04529
               4675 *    ENTERED FROM EXEC VIA "E" DIRECTIVE                 $03 04530
               4676 *                                                        $03 04531
012530 002000 A 4677 EDRM   CALL   PBUF         FILL PRINT BUF WITH ASSCII SPACES $03 04532
012531 014575 R
012532 002000 A 4678        JMPM   FETCHA        GET WHICH CONTROL STORE        $03 04533
012533 015644 R
012534 001010 A 4679        JAZ    EXC90                                       $03 04534
012535 001147 R
012536 006140 A 4680        SUBI   0303         C ?                            $03 04535
012537 000303 A
012540 001010 A 4681        JAZ    E110         CENTRAL-GO TO CENTRAL ROUTINE  $03 04536
012541 011643 R
012542 005311 A 4682        DAR                 D ?                            $03 04537
012543 001010 A 4683        JAZ    EDR2         DECODER                        $03 04538
012544 012547 R
012545 001000 A 4684        JMP    EXC90        INPUT ERROR                    $03 04539
012546 001147 R
012547 002000 A 4685 EDR2   JMPM   FETCHA        INPUT A OR B DCS               $03 04540
012550 015644 R
012551 001010 A 4686        JAZ    EXC90                                       $03 04541
012552 001147 R
012553 054152 A 4687        STA    ABDCS                                       $03 04542
012554 006140 A 4688        SUBI   0301         A ?                            $03 04543
012555 000301 A
012556 001010 A 4689        JAZ    ED10         YES                            $03 04544
012557 012565 R
012560 005311 A 4690        DAR                 B ?                            $03 04545
012561 001010 A 4691        JAZ    ED20         YES                            $03 04546
012562 012601 R
012563 001000 A 4692        JMP    EXC90        INPUT ERROR                    $03 04547
012564 001147 R
               4693 *   DECODE ROM A(DRM1) IS USED WITH INST REG BITS 15-12   $03 04548
012565 002000 A 4694 ED10   CALL   ED30         INPUT ROM ADDR(0-F)            $03 04549
012566 012615 R
012567 054137 A 4695        STA    ED41         TEMP STORE                     $03 04550
012570 127000 I 4696 ED11   ADD    DRM2         ADDR OF DCSA                   $03 04551
012571 005014 A 4697        TAX                                               $03 04552
012572 025000 A 4698        LDB    0,1                                        $03 04553
012573 002000 A 4699        CALL   ED40         TYPE CONTENTS                  $03 04554
012574 012630 R
012575 002000 A 4700        CALL   ED50         CHANGE IT AND/OR EXIT          $03 04555
012576 012644 R
012577 001000 A 4701        JMP    ED11         RETURN HERE IF SEQ VIA COMMA TERMINATOR $03 04556
012600 012570 R
               4702 *                                                        $03 04557
               4703 *   DECODE ROM B(DRM2) IS USED WITH INST REG BITS 11-8    $03 04558
012601 002000 A 4704 ED20   CALL   ED30         INPUT ROM B ADDR(0-F)          $03 04559
012602 012615 R
012603 054123 A 4705        STA    ED41         TEMP STORE                     $03 04560
012604 127000 I 4706 ED21   ADD    DRM1         ADDR OF DCSB                   $03 04561
012605 005014 A 4707        TAX                                               $03 04562
012606 025000 A 4708        LDB    0,1                                        $03 04563
012607 002000 A 4709        CALL   ED40         TYPE CONTENTS                  $03 04564
012610 012630 R
012611 002000 A 4710        CALL   ED50                                       $03 04565
012612 012644 R
012613 001000 A 4711        JMP    ED21         RTN HERE IF SEQ VIA COMMA TERMINATOR $03 04566
012614 012604 R
               4712 *                                                        $03 04567
               4713 *    INPUT HEX 0-F FOR DECODE ROM ADDR                   $03 04568
012615 000000 A 4714 ED30   ENTR                                             $03 04569
012616 002000 A 4715        JMPM   FETCHA        INPUT CONTROL STORE ADDRESS    $03 04570
012617 015644 R
012620 001010 A 4716        JAZ    EXC90                                       $03 04571
012621 001147 R
012622 002000 A 4717        CALL   CONV         CONVERT TO HEX                 $03 04572
012623 012732 R
012624 001002 A 4718        JAP*   ED30         JMP IF LEGAL                   $03 04573
012625 112615 R
012626 001000 A 4719        JMP    EXC90        INPUT ERROR                    $03 04574
012627 001147 R
               4720 *                                                        $03 04575
               4721 *    OUTPUT CONTENTS OF B REG TO TTY PRINTER AS 4 HEX CHAR'S $03 04576
012630 000000 A 4722 ED40   ENTR                                             $03 04577
012631 074076 A 4723        STX    ED42         SAVE REG ADDR                  $03 04578
012632 006030 A 4724        LDXI   BUFR+1       OUTPUT BUFFER ADDR             $03 04579
012633 000201 R
012634 002000 A 4725        CALL   DH           CONVERT TO ASCII               $03 04580
012635 014514 R
012636 002000 A 4726        CALL   SIOUT,5,BUFR   OUTPUT                       $03 04581
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012637 015406 R
012640 000005 A
012641 000200 R
012642 001000 A 4727          RETU*   ED40                                    $03 04582
012643 112630 R
                4728 *
                4729 *                                                        $03 04583
                                                                              $03 04584
012644 000000 A 4730 ED50     ENTR                                            $03 04585
012645 002000 A 4731          JMPM    INA       INPUT 1 - 4 HEX DIGITS        $03 04586
012646 013364 R
012647 151240 A 4732          DATA    'R'                                     $03 04587
012650 001040 A 4733          JXZ     EXC10                                   $03 04588
012651 001111 R
012652 074056 A 4734          STX     ED43      SAVE LAST CHAR INPUT          $03 04589
012653 001020 A 4735          JBZ     ED51                                    $03 04590
012654 012657 R
012655 034052 A 4736          LDX     ED42      ADDR OF REG                   $03 04591
012656 055000 A 4737          STA     0,1       STORE NEW VALUE               $03 04592
012657 014051 A 4738 ED51     LDA     ED43                                    $03 04593
012660 006140 A 4739          SUBI    0254      COMMA ?                       $03 04594
012661 000254 A
012662 001010 A 4740          JAZ     *+4       YES-                          $03 04595
012663 012666 R
012664 001000 A 4741          JMP     EXC10     NO-RETURN TO EXEC             $03 04596
012665 001111 R
                4742 *    SEQUENCE TO NEXT ROM LOCATION                       $03 04597
012666 044040 A 4743          INR     ED41      ROM LOC 0-16                  $03 04598
012667 014037 A 4744          LDA     ED41                                    $03 04599
012670 006140 A 4745          SUBI    16                                      $03 04600
012671 000020 A
012672 001004 A 4746          JAN     *+4       JMP IF IN RANGE 0-16          $03 04601
012673 012676 R
012674 001000 A 4747          JMP     EXC10     RTN TO EXEC                   $03 04602
012675 001111 R
012676 006010 A 4748          LDAI    0120240   BLANK-BLANK                   $03 04603
012677 120240 A
012700 054023 A 4749          STA     EDA                                     $03 04604
012701 014024 A 4750          LDA     ABDCS     A OR B DCS                    $03 04605
012702 004250 A 4751          LRLA    8         MOVE TO LEFT BYTE             $03 04606
012703 054007 A 4752          STA     EDAB      OVERLAY ORAI OPPERAND         $03 04607
012704 024022 A 4753          LDB     ED41      NEXT DCS ADDRESS              $03 04608
012705 004054 A 4754          LRLB    12                                      $03 04609
012706 002000 A 4755          CALL    OH2       CONVERT TO ASCII              $03 04610
012707 014541 R
012710 006150 A 4756          ANAI    0377                                    $03 04611
012711 000377 A
012712 006110 A 4757          ORAI    0140000                                 $03 04612
012713 140000 A
012713                4758 EDAB   BES     0                                   $03 04613
012714 054010 A 4759          STA     EDA+1                                   $03 04614
012715 002000 A 4760          CALL    SIOUT,2,EDA   OUTPUT NEXT LOCATION      $03 04615
012716 015406 R
012717 000002 A
012720 012724 R
012721 014005 A 4761          LDA     ED41      NEXT DCS ADDR                 $03 04616
012722 001000 A 4762          RETU*   ED50                                    $03 04617
012723 112640 R
012724                4763 EDA    BSS     2         MESSAGE BUFFER            $03 04618
012726 000000 A 4764 ABDCS    DATA    0         A OR B DCS FLAG               $03 04619
                4765 *                                                        $03 04620
012727 000000 A 4766 ED41     DATA    0         SAVE HEX INPUT(0-F)           $03 04621
012730 000000 A 4767 ED42     DATA    0         TEMP STORE                    $03 04622
012731 000000 A 4768 ED43     DATA              TEMP STORE                    $03 04623
                4769 *                                                        $03 04624
                4770 *    CONVERT ASCII CHAR TO HEX DIGIT                     $03 04625
                4771 *                                                        $03 04626
                4772 *    CALLING SEQUENCE                                    $03 04627
                4773 *    LDA     ASCII CHAR TO BE CONVERTED                  $03 04628
                4774 *    JMPM    CONV                                        $03 04629
                4775 *                                                        $03 04630
                4776 *    RETURN  A CONTAINS HEX DIGIT IF LEGAL               $03 04631
                4777 *            A SET NEGATIVE IF NOT                       $03 04632
                4778 *                                                        $03 04633
012732 000000 A 4779 CONV     ENTR                                            $03 04634
012733 054031 A 4780          STA     CONV3     SAVE CHAR                     $03 04635
012734 006140 A 4781          SUBI    0260      ASCII 0                       $03 04636
012735 000260 A
012736 054026 A 4782          STA     CONV3     SAVE VALUE                    $03 04637
012737 001004 A 4783          JAN*    CONV      RETURN IF ILLEGAL             $03 04638
012740 112732 R
012741 006140 A 4784          SUBI    012       0272                          $03 04639
012742 000012 A
012743 001004 A 4785          JAN     CONV1     JUMP IF 0-9                   $03 04640
012744 012760 R
012745 006140 A 4786          SUBI    07        ASCII A  0301                 $03 04641
012746 000007 A
012747 001004 A 4787          JAN*    CONV      RETURN IF ILLEGAL             $03 04642
012750 112732 R
012751 006140 A 4788          SUBI    06        ASCII G  0307                 $03 04643
012752 000006 A
012753 001002 A 4789          JAP     CONV2     JUMP IF ILLEGAL               $03 04644
012754 012762 R
012755 006120 A 4790          ADDI    020       A-F                           $03 04645
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012756 000020 A                                                                                    S03 04646
012757 001006 A 4791            DATA    01006           SKIP NEXT INSTRUCTION                      S03 04646
012760 014004 A 4792 CONV1      LDA     CONV3           0-9                                        S03 04647
012761 001006 A 4793            DATA    01006           SKIP NEXT INSTRUCTION                      S03 04648
012762 005301 A 4794 CONV2      DECR    01              SET A NEGATIVE                             S03 04649
012763 001000 A 4795            JMP*    CONV            RETURN                                     S03 04650
012764 112732 R
                4796 *                                                                             S03 04651
012765 000000 A 4797 CONV3      DATA    0               TEMP STORAGE                               S03 04652
                4798            EJEC                                                               S03 04653
                4799 *                                                                             S03 04654
                4800 *          THIS ROUTINE WILL TAKE THE ROM WORD INDEXED                        S03 04655
                4801 *          BY X AND BREAK IT DOWN INTO ITS SEPARATE FIELDS                    S03 04656
                4802 *                                                                             S03 04657
                4803 *          CALLING SEQUENCE                                                   S03 04658
                4804 *          JMPM    FELD                                                       S03 04659
                4805 *                                                                             S03 04660
                4806 *          RETURN                                                             S03 04661
                4807 *          THE FIELDS WILL BE STORED IN XTS, XAF, XMS, ETC.                   S03 04662
                4808 *                                                                             S03 04663
012766 000000 A 4809 FELD       ENTR                                                               S03 04664
012767 006030 A 4810            LDXI    DROM                                                       S03 04665
012770 000546 R
012771 015057,A 4811            LDA     NROM,1          NEXT ROM AR                                S03 04666
012772 004242 A 4812            LRLA    2               TIMES FOUR                                 S03 04667
012773 127000 I 4813            ADD     DBUF            BASE OF CCS PAGE                           S03 04668
012774 005014 A 4814            TAX                                                                S03 04669
012775 015000 A 4815            LDA     0,1             FIRST 16-BITS OF ROM WORD                  S03 04670
012776 054175 A 4816            STA     FD09                                                       S03 04671
012777 015001 A 4817            LDA     1,1             SECOND 16-BITS OF ROM WORD                 S03 04672
013000 054174 A 4818            STA     FD09+1                                                     S03 04673
013001 015002 A 4819            LDA     2,1             THIRD 16-BITS OF ROM WORD                  S03 04674
013002 054173 A 4820            STA     FD09+2                                                     S03 04675
013003 015003 A 4821            LDA     3,1             FOURTH 16-BITS OF ROM WORD                 S03 04676
013004 054172 A 4822            STA     FD09+3                                                     S03 04677
                4823 *                                                                             S03 04678
013005 074173 A 4824            STX     FD11            SAVE X                                     S03 04679
013006 006030 A 4825            LDXI    DROM                                                       S03 04680
013007 000546 R
013010 024166 A 4826            LDB     FD09+3                                                     S03 04681
013011 004450 A 4827            LLRL    010                                                        S03 04682
013012 002000 A 4828            CALL    CDAB            DETERMINE A&B FIELDS                       S03 04683
013013 013202 R
013014 034163 A 4829            LDX     FD10            ADDR OF FIRST ROM FIELD STORAGE            S03 04684
                4830 *                                                                             S03 04685
013015 024156 A 4831            LDB     FD09            FIRST 16-BITS                              S03 04686
                4832 *                                                                             S03 04687
013016 005001 A 4833            TZA                                                                S03 04688
013017 004444 A 4834            LLRL    4                                                          S03 04689
013020 055000 A 4835            STA     XTS,1           TS FIELD                                   S03 04690
                4836 *                                                                             S03 04691
013021 005001 A 4837            TZA                                                                S03 04692
013022 004445 A 4838            LLRL    5                                                          S03 04693
013023 055001 A 4839            STA     XAF,1           AF FIELD                                   S03 04694
                4840 *                                                                             S03 04695
013024 005001 A 4841            TZA                                                                S03 04696
013025 004444 A 4842            LLRL    4                                                          S03 04697
013026 055002 A 4843            STA     XMS,1           MS FIELD                                   S03 04698
                4844 *                                                                             S03 04699
013027 005001 A 4845            TZA                                                                S03 04700
013030 004441 A 4846            LLRL    1                                                          S03 04701
013031 055003 A 4847            STA     XMT,1           MT FIELD                                   S03 04702
013032 005001 A 4848            TZA                                                                S03 04703
013033 004442 A 4849            LLRL    2                                                          S03 04704
                4850 *                                                                             S03 04705
013034 024140 A 4851            LDB     FD09+1          SECOND 16-BITS                             S03 04706
                4852 *                                                                             S03 04707
013035 004442 A 4853            LLRL    2                                                          S03 04708
013036 055004 A 4854            STA     XFS,1           FS FIELD                                   S03 04709
                4855 *                                                                             S03 04710
013037 005001 A 4856            TZA                                                                S03 04711
013040 004442 A 4857            LLRL    2                                                          S03 04712
013041 055005 A 4858            STA     XT,1            T - TEST CONTROL                           S03 04713
                4859 *                                                                             S03 04714
013042 005001 A 4860            TZA                                                                S03 04715
013043 004442 A 4861            LLRL    2                                                          S03 04716
013044 055006 A 4862            STA     XS,1            S - SPECIAL CONTROL                        S03 04717
                4863 *                                                                             S03 04718
013045 005001 A 4864            TZA                                                                S03 04719
013046 004444 A 4865            LLRL    4                                                          S03 04720
013047 055007 A 4866            STA     XG,1            G - GENERAL CONTROL                        S03 04721
                4867 *                                                                             S03 04722
013050 005001 A 4868            TZA                                                                S03 04723
013051 004441 A 4869            LLRL    1                                                          S03 04724
013052 055010 A 4870            STA     XM,1            M - FILE ADDR EXTRACTOR MASK               S03 04725
                4871 *                                                                             S03 04726
013053 005001 A 4872            TZA                                                                S03 04727
013054 004442 A 4873            LLRL    2                                                          S03 04728
013055 055011 A 4874            STA     XAB,1           AB - FILE ADDR LOAD CONTROL                S03 04729
                4875 *                                                                             S03 04730
013056 005001 A 4876            TZA                                                                S03 04731
013057 004443 A 4877            LLRL    3                                                          S03 04732
                4878 *                                                                             S03 04733
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013060 024115 A 4879          LDB     FD09+2          THIRD 16-BITS                                   $03 04734
                4880 *                                                                                $03 04735
013061 004441 A 4881          LLRL    1                                                               $03 04736
013062 055012 A 4882          STA     XIMC,1          IMC - I/O AND MEMORY CONTROL                    $03 04737
                4883 *                                                                                $03 04738
013063 005001 A 4884          TZA                                                                     $03 04739
013064 004442 A 4885          LLRL    2                                                               $03 04740
013065 055013 A 4886          STA     XLB,1           LB - LATCH B CONTROL                            $03 04741
                4887 *                                                                                $03 04742
013066 005001 A 4888          TZA                                                                     $03 04743
013067 004442 A 4889          LLRL    2                                                               $03 04744
013070 055014 A 4890          STA     XLA,1           LA - LATCH A CONTROL                            $03 04745
                4891 *                                                                                $03 04746
013071 005001 A 4892          TZA                                                                     $03 04747
013072 004443 A 4893          LLRL    3                                                               $03 04748
013073 055015 A 4894          STA     XR,1            R - REGISTER CONTROL                            $03 04749
                4895 *                                                                                $03 04750
013074 005001 A 4896          TZA                                                                     $03 04751
013075 004444 A 4897          LLRL    4                                                               $03 04752
013076 055016 A 4898          STA     XF,1            F - ADDER FUNCTION                              $03 04753
                4899 *                                                                                $03 04754
013077 005001 A 4900          TZA                                                                     $03 04755
013100 004441 A 4901          LLRL    1                                                               $03 04756
013101 055017 A 4902          STA     XMD,1           MD - ARITHMETIC/LOGICAL                         $03 04757
                4903 *                                                                                $03 04758
013102 005001 A 4904          TZA                                                                     $03 04759
013103 004442 A 4905          LLRL    2                                                               $03 04760
013104 055020 A 4906          STA     XC,1            C - CARRY                                       $03 04761
                4907 *                                                                                $03 04762
013105 005001 A 4908          TZA                                                                     $03 04763
013106 004441 A 4909          LLRL    1                                                               $03 04764
013107 055021 A 4910          STA     XW,1            W - WRITE FILE                                  $03 04765
                4911 *                                                                                $03 04766
013110 024066 A 4912          LDB     FD09+3          FOURTH 16-BITS                                  $03 04767
                4913 *                                                                                $03 04768
                4914 *                                                                                $03 04769
013111 005001 A 4915          TZA                                                                     $03 04770
013112 004441 A 4916          LLRL    1                                                               $03 04771
013113 055022 A 4917          STA     XDS,1           DP REG SHIFT CONTROL                            $03 04772
                4918 *                                                                                $03 04773
013114 005001 A 4919          TZA                                                                     $03 04774
013115 004441 A 4920          LLRL    1                                                               $03 04775
013116 055023 A 4921          STA     XV,1            DP REG SHIFT GATING CONTROL                     $03 04776
                4922 *                                                                                $03 04777
013117 005001 A 4923          TZA                                                                     $03 04778
013120 004441 A 4924          LLRL    1                                                               $03 04779
013121 055024 A 4925          STA     XY,1            QS CONTROL BIT                                  $03 04780
                4926 *                                                                                $03 04781
013122 005001 A 4927          TZA                                                                     $03 04782
013123 004442 A 4928          LLRL    2                                                               $03 04783
013124 055025 A 4929          STA     XX,1            DP REG LONG SHIFTING END-AROUND CONTROL         $03 04784
                4930 *                                                                                $03 04785
013125 005001 A 4931          TZA                                                                     $03 04786
013126 004443 A 4932          LLRL    3                                                               $03 04787
013127 055026 A 4933          STA     XTC,1           TC - TEST CONTROL                               $03 04788
                4934 *                                                                                $03 04789
                4935 *                                                                                $03 04790
013130 014045 A 4936          LDA     FD09+2          THIRD 16-BITS                                   $03 04791
013131 024045 A 4937          LDB     FD09+3          FOURTH 16-BITS                                  $03 04792
013132 004454 A 4938          LLRL    12                                                              $03 04793
013133 005211 A 4939          CPA                     INVERT 16 BITS FOR MASK                         $03 04794
013134 055031 A 4940          STA     MASK,1          16-BIT ALU MASK                                 $03 04795
                4941 *                                                                                $03 04796
                4942 *    OVERRIDE F FIELD IF SPECIAL ALU MODE(LA=00&LB=0/1&TC=1XX)                   $03 04797
013135 002000 A 4943          CALL    SALU            SPECIAL ALU MODE ?                              $03 04798
013136 004352 R
013137 001000 A 4944          JMP     FD15            YES-                                            $03 04799
013140 013143 R
013141 001000 A 4945          JMP     FD17            NO-                                             $03 04800
013142 013171 R
013143 015016 A 4946 FD15     LDA     XF,1            CLEAR THE TWO LSB'S OF F                        $03 04801
013144 006150 A 4947          ANAI    014             FIELD.THEY WILL BE SET                          $03 04802
013145 000014 A
013146 055016 A 4948          STA     XF,1            AS A FUNCTION OF IRG2 BITS 7&6.                 $03 04803
013147 015052 A 4949          LDA     IRG2,1                                                          $03 04804
013150 006150 A 4950          ANAI    0300                                                            $03 04805
013151 000300 A
013152 004346 A 4951          LSRA    6               IRG2 BITS 7&6=00(XFER) ?                        $03 04806
013153 001010 A 4952          JAZ     FD16            YES-                                            $03 04807
013154 013166 R
013155 005311 A 4953          DAR                     IRG2 BITS 7&6=01(INCR) ?                        $03 04808
013156 001010 A 4954          JAZ     FD16            YES-                                            $03 04809
013157 013166 R
                4955 *    IRG2 BITS 7&6=10(INVERT)OR 11(DECR): SET TWO LSB'S OF F FIELD=10.           $03 04810
013160 006010 A 4956          LDAI    2                                                               $03 04811
013161 000002 A
013162 135016 A 4957          ERA     XF,1                                                            $03 04812
013163 055016 A 4958          STA     XF,1                                                            $03 04813
013164 001000 A 4959          JMP     FD17                                                            $03 04814
013165 013171 R
                4960 *  IRG2 BITS 7&6=00 OR 01: SET TWO LSB'S OF F FIELD TO "01"                      $03 04815
013166 005101 A 4961 FD16     INCR    01              A=01                                            $03 04816
013167 135016 A 4962          ERA     XF,1                                                            $03 04817
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013170 055016 A 4963          STA     XF,1                                    S03 04818
013171 034007 A 4964 FD17     LDX     FD11      RESTORE X                     S03 04819
013172 001000 A 4965          JMP*    FELD      RETURN                        S03 04820
013173 112766 R
               4966 *                                                         S03 04821
013174 000000 A 4967 FD09     DATA    0         TEMP STORAGE                  S03 04822
013175 000000 A 4968          DATA    0         TEMP STORAGE                  S03 04823
013176 000000 A 4969          DATA    0         TEMP STORAGE                  S03 04824
013177 000000 A 4970          DATA    0         TEMP STORAGE                  S03 04825
013200 000546 R 4971 FD10     DATA    DROM      FIRST ROM FIELD ADDR          S03 04826
013201 000000 A 4972 FD11     DATA    0         SAVED X REGISTER              S03 04827
               4973 *                                                         S03 04828
               4974 *                                                         S03 04829
               4975 *     THIS ROUTINE USES THE AB FIELD AND THE M,G&Y FIELDS TO CONTROL  S03 04830
               4976 *   . THE LOADING OF THE A&B FILE ADDRESS FIELDS OF THE ROM WORD      S03 04831
               4977 *    SOME OPERATIONS ARE CONDITIONAL TO FIELDS IMC & S.               S03 04832
               4978 *                                                         S03 04833
               4979 *     CALLING SEQUENCE                                    S03 04834
               4980 *       LDX     ADDR OF ROM FIELDS                        S03 04835
               4981 *       CALL    CDAB                                      S03 04836
               4982 *                                                         S03 04837
               4983 *       RETU    ROM CONTROL FIELDS A AND B ARE ESTABLISHED S03 04838
               4984 *                                                         S03 04839
               4985 *                                                         S03 04840
013202 000000 A 4986 CDAB     ENTR                                            S03 04841
013203 015006 A 4987          LDA     XS,1      S=0?                          S03 04842
013204 001010 A 4988          JAZ     *+4                                     S03 04843
013205 013210 R
013206 001000 A 4989          JMP     CD05      NO                            S03 04844
013207 013215 R
013210 015012 A 4990          LDA     XIMC,1                                  S03 04845
013211 006140 A 4991          SUBI    03        IMC IS 0011                   S03 04846
013212 000003 A
013213 001010 A 4992          JAZ     CD50      YES                           S03 04847
013214 013335 R
               4993 *  CONTROL A&B VIA AB IF NO I/O REQUEST: NOT (S=0 AND IMC=0011)  S03 04848
013215 015011 A 4994 CD05     LDA     XAB,1                                   S03 04849
013216 001010 A 4995          JAZ     CD40                                    S03 04850
013217 013270 R
013220 006140 A 4996          SUBI    2         FIELD AB= 10 ?                S03 04851
013221 000002 A
013222 001010 A 4997          JAZ     CD20      YES-                          S03 04852
013223 013246 R
013224 001002 A 4998          JAP     CD30      AB=3                          S03 04853
013225 013266 R
               4999 *    AB FIELD=01: ALTER B FIELD USING TEST&M FIELDS & IREG #2  S03 04854
               5000 *      LEAVE A FIELD UNALTERED                            S03 04855
013226 002000 A 5001          CALL    CDAX      SELECT 4 BITS OF IRG2,RIGHT JUSTIFY  S03 04856
013227 013337 R
               5002 *                          AND SAVE IN CD2B               S03 04857
013230 015010 A 5003          LDA     XM,1      M FIELD=1 ?                   S03 04858
013231 001010 A 5004          JAZ     *+4                                     S03 04859
013232 013235 R
013233 001000 A 5005          JMP     CD10      YES                           S03 04860
013234 013242 R
               5006 *    AB=01 & M=0                                          S03 04861
013235 014120 A 5007          LDA     CD2B      SET B FIELD EQUAL TO          S03 04862
013236 154120 A 5008          ANA     CD2C      THE 3 LSB'S OF THE SELECTED   S03 04863
013237 055027 A 5009          STA     XB,1      IRG2 FIELD AND SET MSB OF B=0 S03 04864
013240 001000 A 5010          RETU*   CDAB      RETURN                        S03 04865
013241 113202 R
               5011 *    AB=01 & M=1                                          S03 04866
013242 014113 A 5012 CD10     LDA     CD2B      USE 4 BITS FROM               S03 04867
013243 055027 A 5013          STA     XB,1      IRG2 FOR B FIELD              S03 04868
013244 001000 A 5014          RETU*   CDAB      RETURN                        S03 04869
013245 113202 R
               5015 *                                                         S03 04870
               5016 *                                                         S03 04871
               5017 *    AB FIELD=10 : ALTER A FIELD USING TEST&M FIELDS & IREG #2.  S03 04872
               5018 *      LEAVE B FIELD UNALTERED                            S03 04873
013246 002000 A 5019 CD20     CALL    CDAX      SELECT 4 BIT FIELD FROM IRG2  S03 04874
013247 013337 R
013250 015010 A 5020          LDA     XM,1      GET M FIELD                   S03 04875
013251 001010 A 5021          JAZ     *+4                                     S03 04876
013252 013255 R
013253 001000 A 5022          JMP     CD22                                    S03 04877
013254 013262 R
               5023 *    AB=10 & M=0                                          S03 04878
013255 014100 A 5024          LDA     CD2B      SET A FIELD EQUAL TO          S03 04879
013256 154100 A 5025          ANA     CD2C      THE 3 LSB'S OF THE SELECTED   S03 04880
013257 055030 A 5026          STA     XA,1      IRG2 FIELD AND SET MSB OF B=0 S03 04881
013260 001000 A 5027          RETU*   CDAB                                    S03 04882
013261 113202 R
               5028 *    AB=10 & M=1                                          S03 04883
013262 014073 A 5029 CD22     LDA     CD2B      SET B FIELD EQUAL TO THE      S03 04884
013263 055030 A 5030          STA     XA,1      SELECTED 4 BITS FROM IRG2     S03 04885
013264 001000 A 5031          RETU*   CDAB                                    S03 04886
013265 113202 R
               5032 *                                                         S03 04887
               5033 *                                                         S03 04888
               5034 *    AB FIELD= 11                                         S03 04889
               5035 *     LEAVE BOTH A&B FIELDS UNALTERED                     S03 04890
               5036 *     ROUTINE FELD CONTROLS ALTERING A&B AS A FUNCTION OF FIELD AB  S03 04891
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013266 001000 A 5037 CD30   RETU*   CDAB        USE PREVIOUS CONTENTS OF A&B FIELDS        S03 04892
013267 113202 R
                5038 *                                                                     S03 04893
                5039 *                                                                     S03 04894
                5040 *                                                                     S03 04895
                5041 *    AB FIELD=00:                                                     S03 04896
                5042 *                                                                     S03 04897
013270 015010 A 5043 CD40   LDA     XM,1        M FIELD= 1 ?                               S03 04898
013271 001010 A 5044        JAZ     *+4                                                    S03 04899
013272 013275 R
013273 001000 A 5045        JMP     CD44        YES                                        S03 04900
013274 013304 R
013275 004444 A 5046 CD42   LLRL    4           USE VALUES OF A&B IN                       S03 04901
013276 055027 A 5047        STA     XB,1        CURRENT ROM CONTROL                        S03 04902
013277 005001 A 5048        TZA                 WORD FOR THE                               S03 04903
013300 004444 A 5049        LLRL    4           A&B FIELDS                                 S03 04904
013301 055030 A 5050        STA     XA,1                                                   S03 04905
013302 001000 A 5051        RETU*   CDAB        RETURN                                     S03 04906
013303 113202 R
                5052 *                                                                     S03 04907
                5053 *    AB FIELD= 00 AND M=1                                             S03 04908
                5054 *    LEAVE A FIELD UNALTERED                                          S03 04909
013304 006010 A 5055 CD44   LDAI    016         FORCE 3 MSB'S                              S03 04910
013305 000016 A
013306 055027 A 5056        STA     XB,1        OF B FIELD TO 1'S                          S03 04911
013307 015024 A 5057        LDA     XY,1        Y FIELD=0 ?                                S03 04912
013310 001010 A 5058        JAZ     *+4                                                    S03 04913
013311 013314 R
013312 001000 A 5059        JMP     CD46        NO                                         S03 04914
013313 013324 R
013314 015034 A 5060        LDA     XALU,1      COPY ALU 15                                S03 04915
013315 005002 A 5061        TZB                 BIT INTO                                   S03 04916
013316 004441 A 5062        LLRL    1           LSB BIT                                    S03 04917
013317 005021 A 5063        TBA                 OF                                         S03 04918
013320 135027 A 5064        ERA     XB,1        B FIELD                                    S03 04919
013321 055027 A 5065        STA     XB,1                                                   S03 04920
013322 001000 A 5066        RETU*   CDAB        RETURN                                     S03 04921
013323 113202 R
                5067 *    AB=00, M=1, Y(W)=1 : OR01 INTO B0                                S03 04922
013324 006017 A 5068 CD46   LDAE    DOT1        OREG BEFORE LAST UPDATE(TIMING SITUATION)  S03 04923
013325 007057 R
013326 006150 A 5069        ANAI    02          SELECT BIT OR01 (LOOK AHEAD)               S03 04924
013327 000002 A
013330 004341 A 5070        LSRA    1                                                      S03 04925
013331 135027 A 5071        ERA     XB,1        B FIELD                                    S03 04926
013332 055027 A 5072        STA     XB,1                                                   S03 04927
013333 001000 A 5073        RETU*   CDAB        RETURN                                     S03 04928
013334 113202 R
                5074 *                                                                     S03 04929
                5075 *                                                                     S03 04930
                5076 *    S=0 &IM=0011                                                     S03 04931
                5077 *    AB FIELD USED IN  I/O ADDR  AND SEL F/F                          S03 04932
                5078 *                                                                     S03 04933
                5079 *    I/O NOT SIMULATED AT THIS TIME                                   S03 04934
                5080 *                                                                     S03 04935
013335 001000 A 5081 CD50   JMP     CD42        IF I/O REQUEST:PUT ROM FIELDS INTO A & B.  S03 04936
013336 013275 R
                5082 *                                                                     S03 04937
                5083 *                                                                     S03 04938
                5084 *                                                                     S03 04939
                5085 *                                                                     S03 04940
                5086 *    USE TS FIELD TO SELECT 4-BITS OF IRG2                            S03 04941
013337 000000 A 5087 CDAX   ENTR                                                           S03 04942
013340 015000 A 5088        LDA     XTS,1       USE 3 LSB'S OF TS FIELD TO SELECT          S03 04943
013341 154015 A 5089        ANA     CD2C        4 BITS FROM IREG #2.                       S03 04944
013342 006130 A 5090        ERAI    04340       FORM LSRA INST TO SELECT 4 BIT FIELD       S03 04945
013343 004340 A
                5091 *                          FROM INST REG. #2                          S03 04946
013344 054010 A 5092        STA     CD2A        TEMP STORE                                 S03 04947
013345 015052 A 5093        LDA     IRG2,1                                                 S03 04948
013346 003000 A 5094        XEC     CD2A        RIGHT JUSTIFY SELECTED 4 BITS OF IREG2     S03 04949
013347 013355 R
013350 006150 A 5095        ANAI    017         SELECT ONLY 4 LSB'S                        S03 04950
013351 000017 A
013352 054003 A 5096        STA     CD2B        TEMP STORE                                 S03 04951
013353 001000 A 5097        JMP*    CDAX                                                   S03 04952
013354 113337 R
013355 000000 A 5098 CD2A   DATA    0           TEMP STORE FOR FORMED LSRA INST            S03 04953
013356 000000 A 5099 CD2B   DATA    0           TEMP STORE FOR 4 BITS SELECTED FROM IRG2   S03 04954
013357 000007 A 5100 CD2C   DATA    7           MASK                                       S03 04955
                5101        EJEC                                                           S03 04956
                5102 *      THIS IS A SUBROUTINE TO INPUT A HEXADECIMAL ADDRESS CONSTANT   S03 04957
                5103 *      MAX 4 DIGITS                                                   S03 04958
                5104 *                                                                     S03 04959
                5105 *      CALLING SEQUENCE                                               S03 04960
                5106 *      JMPM    INA                                                    S03 04961
                5107 *      DATA    'R' OR 'N'  R FOR READ, N FOR NO READ                  S03 04962
                5108 *                                                                     S03 04963
                5109 *      RETURN              A REGISTER CONTAINS THE ADDRESS VALUE      S03 04964
                5110 *                          B REGISTER CONTAINS THE NUMBER OF DIGITS    S03 04965
                5111 *                          X CONTAINS THE LAST INPUT CHAR             S03 04966
                5112 *                                                                     S03 04967
013360 014072 A 5113 INA5   LDA     INAV        GET VALUE                                  S03 04968
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013361 024070 A 5114          LDB     INAN        GET NUMBER OF DIGITS                    $03 04969
013362 034066 A 5115          LDX     INAA        LAST INPUT CHAR                         $03 04970
013363 001000 A 5116          JMP     0           RETURN                                  $03 04971
013364 000000 A
                5117 *                                                                    $03 04972
                5118 *        ENTRY POINT                                                 $03 04973
                5119 *                                                                    $03 04974
013364          5120 INA      BES     0           ENTRY                                   $03 04975
013365 005001 A 5121          TZA                 INITIATE                                $03 04976
013366 054062 A 5122          STA     INAA                                                $03 04977
013367 054062 A 5123          STA     INAN        COUNT                                   $03 04978
013370 054062 A 5124          STA     INAV        VALUE                                   $03 04979
013371 027000 I 5125          LDB     INA          PARAM AREA                              03 04980
013372 016000 A 5126          LDA     0,2          GET PARAM                              03 04981
013373 006047 A 5127          INRE    INA         RESET RETURN ADDR                       $03 04982
013374 013364 R
013375 004350 A 5128          LSRA    8           MOVE CHARACTER DONE INTO LOWER BYTE      $03 04983
013376 006140 A 5129          SUBI    0316        N                                       $03 04984
013377 000316 A
013400 001010 A 5130          JAZ     INA3        NO READ REQUESTED                       $03 04985
013401 013410 R
013402 002000 A 5131          CALL    SIIN        INPUT VALUE                             $03 04986
013403 015220 R
013404 002000 A 5132          JMPM    FETCH        GET FIRST CHAR                          03 04987
013405 015635 R
013406 001000 A 5133          JMP     INA3+2                                              $03 04988
013407 013412 R
                5134 *                                                                    $03 04989
013410 002000 A 5135 INA3     JMPM    FETCHA      GET CHARACTER                           $03 04990
013411 015644 R
013412 001010 A 5136          JAZ     INA5                                                $03 04991
013413 013360 R
013414 054034 A 5137          STA     INAA        SAVE CHAR                               $03 04992
013415 006140 A 5138          SUBI    0240        BLANK                                   $03 04993
013416 000240 A
013417 001010 A 5139          JAZ     INA5        GET OUT                                 $03 04994
013420 013360 R
013421 006140 A 5140          SUBI    014         0254                                    $03 04995
013422 000014 A
013423 001010 A 5141          JAZ     INA5        COMMA                                   $03 04996
013424 013360 R
013425 014023 A 5142          LDA     INAA        INPUT CHAR                              $03 04997
013426 002000 A 5143          JMPM    CONV        CONVERT CHAR TO HEX                     $03 04998
013427 012732 R
013430 001004 A 5144          JAN     INA8        JUMP IF NOT A HEX CHAR                  $03 04999
013431 013447 R
013432 005014 A 5145          TAX                                                         $03 05000
013433 014017 A 5146          LDA     INAV        ACCUMULATED VALUE                       $03 05001
013434 005002 A 5147          TZB                                                         $03 05002
013435 004444 A 5148          LLRL    4                                                   $03 05003
013436 001020 A 5149          JBZ     *+4         JUMP IF NO OVERFLOW                     $03 05004
013437 013442 R
013440 001000 A 5150          JMP     INA8        REJECT CHAR                             $03 05005
013441 013447 R
013442 005051 A 5151          MERG    051         ADD NEW CHAR                            $03 05006
013443 054007 A 5152          STA     INAV        SAVE VALUE                              $03 05007
013444 044005 A 5153          INR     INAN        INCREMENT NUMBER OF DIGITS              $03 05008
013445 001000 A 5154          JMP     INA3        KEEP TRYING                             $03 05009
013446 013410 R
                5155 *                                                                    $03 05010
                5156 *                                                                    $03 05011
013447 001000 A 5157 INA8     JMP     INH8        INPUT ERROR                             $03 05012
013450 013603 R
013451 000000 A 5158 INAA     DATA    0           LAST INPUT CHAR                         $03 05013
013452 000000 A 5159 INAN     DATA    0           NO OF CHARS INPUT                       $03 05014
013453 000000 A 5160 INAV     DATA    0           ACCUMULATED INPUT VALUE                 $03 05015
                5161 *                                                                    $03 05016
                5162          EJEC                                                        $03 05017
                5163 *                                                                    $03 05018
                5164 *        THIS IS A SUBROUTINE TO INPUT A HEXIDECIMAL CONSTANT        $03 05019
                5165 *                                                                    $03 05020
                5166 *        CALLING SEQUENCE                                            $03 05021
                5167 *        JMPM    INH                                                 $03 05022
                5168 *                                                                    $03 05023
                5169 *        RETURN  B CONTAINS THE NUMBER OF DIGITS INPUT               $03 05024
                5170 *                X CONTAINS LAST INPUT CHAR                          $03 05025
                5171 *                VALUE IS IN V,V+1,V+2,V+3                           $03 05026
                5172 *                                                                    $03 05027
013454 002000 A 5173 INH5     JMPM    MOVW        MOVE INPUT TO V,V+1,V+2,V+3             $03 05028
013455 014510 R
013456 000004 A 5174          DATA    4           WORD COUNT                              $03 05029
013457 013617 R 5175          DATA    INHT        START LOCATION                          $03 05030
013460 000476 R 5176          DATA    V           END LOCATION                            $03 05031
                5177 *                                                                    $03 05032
013461 024134 A 5178          LDB     INHN        GET DIGIT COUNT                         $03 05033
013462 034131 A 5179          LDX     INHA        LAST INPUT CHAR                         $03 05034
013463 001000 A 5180          JMP     0           RETURN                                  $03 05035
013464 000000 A
                5181 *                                                                    $03 05036
                5182 *        ENTRY POINT                                                 $03 05037
                5183 *                                                                    $03 05038
013464          5184 INH      BES     0           ENTRY                                   $03 05039
013465 005001 A 5185          TZA                 INITIATE                                $03 05040
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013466 054127 A 5186          STA     INHN        DIGIT COUNT                                    S03 05041
013467 054127 A 5187          STA     INHT        CLEAR INPUT DATA STRING                        S03 05042
013470 054127 A 5188          STA     INHT+1                                                     S03 05043
013471 054127 A 5189          STA     INHT+2                                                     S03 05044
013472 054127 A 5190          STA     INHT+3                                                     S03 05045
                5191 *                                                                           S03 05046
013473 002000 A 5192          CALL    SIIN        INPUT VALUE                                    S03 05047
013474 015220 R
013475 002000 A 5193          JMPM    FETCH       GET FIRST CHAR                                 S03 05048
013476 015635 R
013477 054114 A 5194          STA     INHA                                                   F   ********
013500 006140 A 5195          SUBI    '='                                                    F   ********
013501 000275 A
013502 001010 A 5196          JAZ     INH6        IF ZERO BEFORE STORE FIELD VALUE           F   ********
013503 013573 R
013504 006140 A 5197          SUBI    '+'-'='                                                F   ********
013505 177756 A
013506 001010 A 5198          JAZ     INH7        IF DO NOT ZERO BEFORE STORE FIELD VALUE    F   ********
013507 013601 R
013510 014103 A 5199          LDA     INHA                                                   F   ********
013511 001000 A 5200          JMP     INH4        CONTINUE PROCESSING                        F   ********
013512 013516 R
013513 002000 A 5201 INH3     JMPM    FETCHA                                                     S03 05050
013514 015644 R
013515 054076 A 5202          STA     INHA        SAVE CHAR                                      S03 05051
       013516 R 5203 INH4     EQU     *                                                      F   ********
013516 001010 A 5204          JAZ     INH5        CARRIAGE RETURN--RETURN TO EXEC                S03 05052
013517 013454 R
013520 006140 A 5205          SUBI    0240        BLANK                                          S03 05053
013521 000240 A
013522 001010 A 5206          JAZ     INH5        JUMP IF BLANK                                  S03 05054
013523 013454 R
013524 006140 A 5207          SUBI    014         0254                                           S03 05055
013525 000014 A
013526 001010 A 5208          JAZ     INH5        JUMP IF COMMA                                  S03 05056
013527 013454 R
013530 014063 A 5209          LDA     INHA        GET LAST CHAR                                  S03 05057
013531 002000 A 5210          JMPM    CONV        CONVERT CHAR TO HEX                            S03 05058
013532 012732 R
013533 001004 A 5211          JAN     INH8        JUMP IF ILLEGAL                                S03 05059
013534 013603 R
013535 005014 A 5212          TAX                                                                S03 05060
                5213 *                                                                           S03 05061
                5214 *        ADD CHAR TO DATA STRING                                            S03 05062
                5215 *                                                                           S03 05063
013536 024057 A 5216 INH2     LDB     INHN        GET COUNT                                      S03 05064
013537 074055 A 5217          STX     INHC        SAVE DIGIT                                     S03 05065
013540 014056 A 5218          LDA     INHT        CHARS 1-4                                      S03 05066
013541 005002 A 5219          TZB                                                                S03 05067
013542 004444 A 5220          LLRL    4           SHIFT OUT MS CHAR                              S03 05068
013543 001020 A 5221          JRZ     *+4         JUMP IF NO OVERFLOW                            S03 05069
013544 013547 R
013545 001000 A 5222          JMP     INH8        16 CHARS ALREADY INPUT                         S03 05070
013546 013603 R
013547 014047 A 5223          LDA     INHT        CHARS 1-4                                      S03 05071
013550 024047 A 5224          LDB     INHT+1      CHARS 5-8                                      S03 05072
013551 004444 A 5225          LLRL    4                                                          S03 05073
013552 054044 A 5226          STA     INHT        NEW CHARS 1-4                                  S03 05074
013553 005001 A 5227          TZA                                                                S03 05075
013554 004454 A 5228          LLRL    12                                                         S03 05076
013555 024043 A 5229          LDB     INHT+2      CHARS 9-12                                     S03 05077
013556 004444 A 5230          LLRL    4                                                          S03 05078
013557 054040 A 5231          STA     INHT+1      NEW CHARS 5-8                                  S03 05079
013560 005001 A 5232          TZA                                                                S03 05080
013561 004454 A 5233          LLRL    12                                                         S03 05081
013562 024037 A 5234          LDB     INHT+3      CHARS 13-16                                    S03 05082
013563 004444 A 5235          LLRL    4                                                          S03 05083
013564 054034 A 5236          STA     INHT+2      CHARS 9-12                                     S03 05084
013565 014027 A 5237          LDA     INHC        INPUT DIGIT                                    S03 05085
013566 005031 A 5238          MERG    031         ADD NEW DIGIT                                  S03 05086
013567 054032 A 5239          STA     INHT+3      CHARS 13-16                                    S03 05087
                5240 *                                                                           S03 05088
013570 044025 A 5241          INR     INHN        INCREMENT COUNT                                S03 05089
013571 001000 A 5242          JMP     INH3        KEEP TRYING                                    S03 05090
013572 013513 R
013573 027000 I 5243 INH6     LDB     E113        ROM WORD ADDR                              F   ********
013574 005001 A 5244          TZA                                                            F   ********
013575 056000 A 5245          STA     0,2         ZERO                                       F   ********
013576 056001 A 5246          STA     1,2         ENTIRE                                     F   ********
013577 056002 A 5247          STA     2,2         ROM                                        F   ********
013600 056003 A 5248          STA     3,2         WORD                                       F   ********
013601 001000 A 5249 INH7     JMP     FLDCG       PROCESS FIELD CHANGE DIRECTIVE             F   ********
013602 013623 R
                5250 *                                                                           S03 05091
013603 002000 A 5251 INH8     CALL    SIOUT,3,INER    OUTPUT ERROR                               S03 05092
013604 015406 R
013605 000003 A
013606 013611 R
013607 001000 A 5252          JMP     EXC10       TRY AGAIN                                      S03 05093
013610 001111 R
                5253 *                                                                           S03 05094
013611 120240 A 5254 INER     DATA    '  MS02'    ILLEGAL HEX INPUT                              S03 05095
013612 146723 A
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013613 130262 A
                    5255 *                                                                                  S03 05096
013614 000000 A     5256 INHA   DATA    0               LAST INPUT CHAR                                     S03 05097
013615 000000 A     5257 INHC   DATA    0               LAST INPUT DIGIT                                    S03 05098
013616 000000 A     5258 INHN   DATA    0                                                                   S03 05099
013617              5259 INHT   BSS     4               INPUT STRING                                        S03 05100
                    5260        EJEC                                                                    F   ********
                    5261 *      THIS IS A SUBROUTINE TO HANDLE THE CHANGE CENTRAL CONTROL               F   ********
                    5262 *      STORE BY FIELD SPECIFICATION                                            F   ********
                    5263 *                                                                              F   ********
                    5264 *      CALLING SEQUENCE                                                        F   ********
                    5265 *      JMP     FLDCG                                                           F   ********
                    5266 *                                                                              F   ********
                    5267 *      RETURNS TO SIMULATOR EXEC FOR PROCESSING OF NEXT DIRECTIVE              F   ********
                    5268 *                                                                              F   ********
      013623 R      5269 FLDCG  EQU     *                                                               F   ********
013623 002000 A     5270        JMPM    FETCHA                                                          F   ********
013624 015644 R
013625 004250 A     5271 FLD05  LRLA    8                                                               F   ********
013626 054174 A     5272        STA     FLD90           SAVE LEFT BYTE                                  F   ********
013627 002000 A     5273        JMPM    FETCHA                                                          F   ********
013630 015644 R
013631 134171 A     5274        ERA     FLD90           FORM 2 CHAR NAME                                F   ********
013632 054170 A     5275        STA     FLD90                                                           F   ********
013633 006030 A     5276        LDXI    FLNAM           FIELD NAME TABLE                                F   ********
013634 014053 R
013635 015000 A     5277 FLD10  LDA     0,1             FIELD NAME                                      F   ********
013636 001010 A     5278        JAZ     FLD60           IF END OF TABLE                                 F   ********
013637 014031 R
013640 134162 A     5279        ERA     FLD90                                                           F   ********
013641 001010 A     5280        JAZ     FLD20           IF MATCH FOUND                                  F   ********
013642 013650 R
013643 005144 A     5281        IXR                                                                     F   ********
013644 005144 A     5282        IXR                                                                     F   ********
013645 005144 A     5283        IXR                                                                     F   ********
013646 001000 A     5284        JMP     FLD10           CONTINUE SCAN THROUGH TABLE                     F   ********
013647 013635 R
      013650 R      5285 FLD20  EQU     *                                                               F   ********
013650 074154 A     5286        STX     FLD92           SAVE TABLE PTR                                  F   ********
013651 002000 A     5287        JMPM    INA             FETCH CHANGE VALUE                              F   ********
013652 013364 R
013653 147240 A     5288        DATA    'N'                                                             F   ********
013654 074151 A     5289        STX     FLD93           SAVE TERM CHAR                                  F   ********
013655 054146 A     5290        STA     FLD91           SAVE VALUE                                      F   ********
013656 034146 A     5291        LDX     FLD92           FIELD TABLE PTR                                 F   ********
013657 025001 A     5292        LDB     1,X             FIELD SIZE                                      F   ********
013660 014005 A     5293        LDA     FLD25                                                           F   ********
013661 006150 A     5294        ANAI    07740                                                           F   ********
013662 007740 A
013663 005031 A     5295        MERGE   031             FORM RIGHT SHIFT                                F   ********
013664 054001 A     5296        STA     FLD25                                                           F   ********
013665 014136 A     5297        LDA     FLD91           VALUE                                           F   ********
013666 004340 A     5298 FLD25  LSRA    0                                                               F   ********
013667 001010 A     5299        JAZ     FLD30           IF VALUE WITHIN BOUNDS                          F   ********
013670 013673 R
013671 001000 A     5300        JMP     FLD65           RANGE ERROR                                     F   ********
013672 014037 R
013673 015002 A     5301 FLD30  LDA     2,X             LOW ORDER BIT POSITION                          F   ********
013674 004344 A     5302        LSRA    4                                                               F   ********
013675 005211 A     5303        CPA                                                                     F   ********
013676 006150 A     5304        ANAI    8                                                               F   ********
013677 000003 A
013700 127000 I     5305        ADD     E113            FETCH 16 BIT WORD ADDR                          F   ********
013701 054126 A     5306        STA     FLD95                                                           F   ********
013702 015002 A     5307        LDA     2,X                                                             F   ********
013703 005012 A     5308        TAB                                                                     F   ********
013704 006140 A     5309        SUBI    31              CHECK IF IM FIELD                               F   ********
013705 000037 A
013706 001010 A     5310        JAZ     FLD50           YES, SPECIAL PROCESSING                         F   ********
013707 013770 R
013710 006140 A     5311        SUBI    15              CHECK IF FS FIELD                               F   ********
013711 000017 A
013712 001010 A     5312        JAZ     FLD50A          YES, SPECIAL PROCESSING                         F   ********
013713 013764 R
013714 005021 A     5313        TBA                     NEITHER IM NOR FD, RESTORE VALUE                F   ********
013715 006150 A     5314        ANAI    017             WORD DISPLACEMENT                               F   ********
013716 000017 A
013717 005012 A     5315        TAB                                                                     F   ********
013720 014007 A     5316        LDA     FLD35                                                           F   ********
013721 006150 A     5317        ANAI    07740                                                           F   ********
013722 007740 A
013723 005031 A     5318        MERGE   031                                                             F   ********
013724 054003 A     5319        STA     FLD35           FORM LEFT ROTATE                                F   ********
013725 025001 A     5320        LDB     1,X             FIELD SIZE                                      F   ********
013726 006016 A     5321        LDAE    FLMSK,B         BIT MASK FOR FIELD SIZE                         F   ********
013727 014167 R
013730 004240 A     5322 FLD35  LRLA    0               MOVE MASK INTO POSITION                         F   ********
013731 005211 A     5323        CPA                                                                     F   ********
013732 024075 A     5324        LDB     FLD95                                                           F   ********
013733 156000 A     5325        ANA     0,B             MASK OFF BITS FROM WORD                         F   ********
013734 005012 A     5326        TAB                                                                     F   ********
013735 014066 A     5327        LDA     FLD91           NEW FIELD VALUE                                 F   ********
013736 003000 A     5328        XEC     FLD35           MOVE VALUE INTO POSITION                        F   ********
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013737 013730 R
013740 005031 A 5329          MERGE   031             UPDATE WORD                    F ********
013741 024066 A 5330          LDB     FLD95           ROM WORD ADDR                  F ********
013742 056000 A 5331          STA     0,B                                            F ********
       013743 R 5332 FLD39    EQU     *                                              F ********
013743 014062 A 5333          LDA     FLD93           TERMINATING CHAR               F ********
013744 006140 A 5334          SUBI    ','                                            F ********
013745 000254 A
013746 001010 A 5335          JAZ     FLD40           IF MORE CHARS IN RECORD        F ********
013747 013752 R
013750 001000 A 5336          JMP     EXC10           GET NEW DIRECTIVE              F ********
013751 001111 R
       013752 R 5337 FLD40    EQU     *                                              F ********
013752 002000 A 5338          JMPM    FETCHA          FETCH NEXT CHAR                F ********
013753 015644 R
013754 005012 A 5339          TAB                                                    F ********
013755 006140 A 5340          SUBI    ' '                                            F ********
013756 000240 A
013757 001010 A 5341          JAZ     E114A           IF DISPLAY NEXT WORD           F ********
013760 011731 R
013761 005021 A 5342          TBA                                                    F ********
013762 001000 A 5343          JMP     FLD05           CONTINUE DIRECTIVE PROCESSING  F ********
013763 013623 R
       013764 R 5344 FLD50A   EQU     *               SPECIAL PROCESSING FOR FS FIELD F ********
013764 006020 A 5345          LDBI    2               SET FOR FS FIELD ROTATE        F ********
013765 000002 A
013766 001000 A 5346          JMP     FLD50B                                         F ********
013767 013771 R
       013770 R 5347 FLD50    EQU     *               SPECIAL PROCESSING FOR IM FIELD F ********
013770 005102 A 5348          INCR    02              SET FOR IM FIELD ROTATE        F ********
       013771 R 5349 FLD50B   EQU     *                                              F ********
013771 064010 A 5350          STB     FLD51           FIELD FLAG                     F ********
013772 005021 A 5351          TBA                                                    F ********
013773 006120 A 5352          ADDI    16              SET UP LLRL INST               F ********
013774 000020 A
013775 124024 A 5353          ADD     FLLRL                                          F ********
013776 054012 A 5354          STA     FLD56           ROTATE INTO A REG LSBS         F ********
013777 006010 A 5355          LDAI    16                                             F ********
014000 000020 A
014001 006140 A 5356          SUBI    0               SET UP RESTORE ROTATE          F ********
014002 000000 A
014002        5357 FLD51      BES     0                                              F ********
014003 124016 A 5358          ADD     FLLRL           LLRL INST                      F ********
014004 054010 A 5359          STA     FLD57                                          F ********
014005 034022 A 5360          LDX     FLD95           CCS WORD SUB ADDR              F ********
014006 015000 A 5361          LDA     0,X             LSB PORTION                    F ********
014007 005344 A 5362          DXR                     POINT TO NEXT HIGH ORDER BITS  F ********
014010 025000 A 5363          LDB     0,X             MSB PORTION                    F ********
014011 004440 A 5364 FLD56    LLRL    0               POSITION FIELD INTO A REG LSBS F ********
014012 006150 A 5365          ANAI    0177760         MASK OUT FIELD                 F ********
014013 177760 A
014014 124007 A 5366          ADD     FLD91           CHANGE VALUE                   F ********
014015 004440 A 5367 FLD57    LLRL    0               RETURN FIELDS TO PROPER POSITION F ********
014016 065000 A 5368          STB     0,X                                            F ********
014017 055001 A 5369          STA     1,X                                            F ********
014020 001000 A 5370          JMP     FLD39           CONTINUE FIELD PROCESSING      F ********
014021 013743 R
       5371 *                                                                        F ********
014022 004440 A 5372 FLLRL    LLRL    0               LLRL INSTRUCTION BASE VALUE    F ********
014023 000000 A 5373 FLD90    DATA    0               FIELD NAME                     F ********
014024 000000 A 5374 FLD91    DATA    0               NEW FIELD VALUE                F ********
014025 000000 A 5375 FLD92    DATA    0               NAME TABLE POINTER             F ********
014026 000000 A 5376 FLD93    DATA    0               TERM CHAR                      F ********
014027 000000 A 5377 FLD94    DATA    0                                              F ********
014030 000000 A 5378 FLD95    DATA    0               ROM WORD SUBCOMP ADDR          F ********
       5379 *                                                                        F ********
014031 002000 A 5380 FLD60    CALL    SIOUT,3,FLER1     OUTPUT FIELD NAME ERROR      F ********
014032 015406 R
014033 000003 A
014034 014045 R
014035 001000 A 5381          JMP     EXC10           TRY AGAIN                      F ********
014036 001111 R
014037 002000 A 5382 FLD65    CALL    SIOUT,3,FLER2     OUTPUT FIELD RANGE ERROR     F ********
014040 015406 R
014041 000003 A
014042 014050 R
014043 001000 A 5383          JMP     EXC10           TRY AGAIN                      F ********
014044 001111 R
014045 120240 A 5384 FLER1    DATA    '  MS16'                                       F ********
014046 146723 A
014047 130666 A
014050 120240 A 5385 FLER2    DATA    '  MS17'                                       F ********
014051 146723 A
014052 130667 A
       5386 *                                                                        F ********
       5387 *  FIELD NAME TABLE                                                      F ********
       5388 *       3 WORD ENTRY                                                     F ********
       5389 *            1=2 CHAR NAME                                               F ********
       5390 *            2=FIELD SIZE                                                F ********
       5391 *            3=LOW ORDER BIT POSITION                                    F ********
       5392 *                                                                        F ********
       014053 R 5393 FLNAM    EQU     *               ********
014053 140701 A 5394          DATA    'AA',4,0        ********
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014054 000004 A
014055 000000 A
014056 141302 A 5395          DATA    'BB',4,4                                F  ********
014057 000004 A
014060 000004 A
014061 151710 A 5396          DATA    'SH',3,8                                F  ********
014062 000003 A
014063 000010 A
014064 154306 A 5397          DATA    'XF',2,11                               F  ********
014065 000002 A
014066 000013 A
014067 153706 A 5398          DATA    'WF',1,13                               F  ********
014070 000001 A
014071 000015 A
014072 153306 A 5399          DATA    'VF',1,14                               F  ********
014073 000001 A
014074 000016 A
014075 151703 A 5400          DATA    'SC',1,15                               F  ********
014076 000001 A
014077 000017 A
014100 153722 A 5401          DATA    'WR',1,16                               F  ********
014101 000001 A
014102 000020 A
014103 141706 A 5402          DATA    'CF',2,17                               F  ********
014104 000002 A
014105 000021 A
014106 146706 A 5403          DATA    'MF',1,19                               F  ********
014107 000001 A
014110 000023 A
014111 143306 A 5404          DATA    'FF',4,20                               F  ********
014112 000004 A
014113 000024 A
014114 151306 A 5405          DATA    'RF',3,24                               F  ********
014115 000003 A
014116 000030 A
014117 146301 A 5406          DATA    'LA',2,27                               F  ********
014120 000002 A
014121 000033 A
014122 146302 A 5407          DATA    'LB',2,29                               F  ********
014123 000002 A
014124 000035 A
014125 144715 A 5408          DATA    'IM',4,31                               F  ********
014126 000004 A
014127 000037 A
014130 140702 A 5409          DATA    'AB',2,35                               F  ********
014131 000002 A
014132 000043 A
014133 146722 A 5410          DATA    'MR',1,37                               F  ********
014134 000001 A
014135 000045 A
014136 143706 A 5411          DATA    'GF',4,38                               F  ********
014137 000004 A
014140 000046 A
014141 151706 A 5412          DATA    'SF',2,42                               F  ********
014142 000002 A
014143 000052 A
014144 152306 A 5413          DATA    'TF',2,44                               F  ********
014145 000002 A
014146 000054 A
014147 143323 A 5414          DATA    'FS',4,46                               F  ********
014150 000004 A
014151 000056 A
014152 146724 A 5415          DATA    'MT',1,50                               F  ********
014153 000001 A
014154 000062 A
014155 146723 A 5416          DATA    'MS',4,51                               F  ********
014156 000004 A
014157 000063 A
014160 140706 A 5417          DATA    'AF',5,55                               F  ********
014161 000005 A
014162 000067 A
014163 152323 A 5418          DATA    'TS',4,60                               F  ********
014164 000004 A
014165 000074 A
014166 000000 A 5419          DATA    0               END OF TABLE            F  ********
                5420 *                                                        F  ********
        014167 R 5421 FLMSK   EQU     *               BIT MASK TABLE          F  ********
014167 000000 A 5422          DATA    0                                       F  ********
014170 000001 A 5423          DATA    01                                      F  ********
014171 000003 A 5424          DATA    03                                      F  ********
014172 000007 A 5425          DATA    07                                      F  ********
014173 000017 A 5426          DATA    017                                     F  ********
014174 000037 A 5427          DATA    037                                     F  ********
                5428          EJEC                                              $03 05101
                5429 *                                                          $03 05102
                5430 *      THIS ROUTINE WILL TAKE THE FIELDS OF THE DATA-LOOP  $03 05103
                5431 *      ROM, CONVERT THEM TO ASCII AND OUTPUT THEM TO THE   $03 05104
                5432 *      LD AS PART OF THE TRACE FUNCTION                    $03 05105
                5433 *      ALSO OUTPUT ROM ADDRESS                             $03 05106
                5434 *                                                          $03 05107
                5435 *      MESSAGE FORMAT IS AS FOLLOWS                        $03 05108
                5436 *                                                          $03 05109
                5437 *          ROM LOC - DDDD                                  $03 05110
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                    5438 *                                                                                  S03 05111
                    5439 *       TS  AF  MS  MT  FS  TF  SF  GF  MR  AS  IM  LB  LA                         S03 05112
                    5440 *       DD  DD  DD  DD  DD  DD  DD  DD  DD  DD  DD  DD  DD                         S03 05113
                    5441 *                                                                                  S03 05114
                    5442 *       RF  FF  MR  CF  WR  SC  VF  WF  XF  SH  BB  AA                             S03 05115
                    5443 *       DD  DD  DD  DD  DD  DD  DD  DD  DD  DD  DD  DD                             S03 05116
                    5444 *                                                                                  S03 05117
                    5445 *   CALLING SEQUENCE                                                               S03 05118
                    5446 *   JMPM    LIST                                                                   S03 05119
                    5447 *                                                                                  S03 05120
                    5448 *   RETURN                                                                         S03 05121
                    5449 *                                                                                  S03 05122
014175 000000 A     5450 LIST ENTR                                                                          S03 05123
014176 027000 I     5451      LDB     CPAG                                                              D   S03 05124
014177 006016 A     5452      LDAE    TRACE,2       TRACE FLAG FOR PAGE ON ?                            D   S03 05125
014200 000472 R
014201 001010 A     5453      JAZ*    LIST          NO-                                                     S03 05126
014202 114175 R
014203 002000 A     5454      JMPM    TRSET         CHECK IF WITHINTRACE BOUNDARIES                         S03 05127
014204 014744 R
014205 001004 A     5455      JAN     LIST5         NO-PRINT CCS ADDR ONLY                                  S03 05128
014206 014307 R
014207 002000 A     5456      CALL    TPFRM         TOP OF FORM                                             S03 05129
014210 014760 R
014211 006030 A     5457 LIST1  LDXI   LISTC+6      LOC TO STORE ADDRESS                                    S03 05130
014212 014430 R
014213 006020 A     5458      LDBI    DROM                                                                  S03 05131
014214 000546 R
014215 026057 A     5459      LDB     NROM,2        GET NEXT ROM ADDRESS                                    S03 05132
014216 002000 A     5460      CALL    OH            CONVERT TO ASCII                                        S03 05133
014217 014514 R
014220 017000 I     5461      LDA     CPAG          CURRENT PAGE                                            S03 05134
014221 006120 A     5462      ADDI    0260                                                                  S03 05135
014222 000260 A
014223 054212 A     5463      STA     LISTC+12                                                              S03 05136
014224 002000 A     5464      CALL    LOOUT,13,LISTC                                                        S03 05137
014225 015470 R
014226 000015 A
014227 014422 R
014230 002000 A     5465      JMPM    SPAC          SPACE LO                                                S03 05138
014231 014747 R
014232 002000 A     5466      CALL    LOOUT,27,LISTA  OUTPUT HEADER                                         S03 05139
014233 015470 R
014234 000033 A
014235 014336 R
014236 014073 A     5467      LDA     LIST6         ADDR OF FIRST FIELD                                     S03 05140
014237 054075 A     5468      STA     LIST9                                                                 S03 05141
014240 006010 A     5469      LDAI    12            FIELD CONVERSION COUNT                                  S03 05142
014241 000014 A
014242 054071 A     5470      STA     LIST8                                                                 S03 05143
014243 002000 A     5471      JMPM    LIST3         OUTPUT DATA TO LO                                       S03 05144
014244 014262 R
                    5472 *                                                                                  S03 05145
014245 002000 A     5473      JMPM    SPAC          SPACE LO                                                S03 05146
014246 014747 R
014247 002000 A     5474      CALL    LOOUT,25,LISTB  OUTPUT HEADER                                         S03 05147
014250 015470 R
014251 000031 A
014252 014371 R
014253 006010 A     5475      LDAI    11            FIELD COUNT                                             S03 05148
014254 000013 A
014255 054056 A     5476      STA     LIST8                                                                 S03 05149
014256 002000 A     5477      JMPM    LIST3         OUTPUT DATA TO LO                                       S03 05150
014257 014262 R
014260 001000 A     5478      JMP*    LIST          RETURN                                                  S03 05151
014261 114175 R
                    5479 *                                                                                  S03 05152
014262 000000 A     5480 LIST3  ENTR                                                                        S03 05153
014263 002000 A     5481      JMPM    PBUF          SETUP LO BUFFER                                         S03 05154
014264 014575 R
014265 034045 A     5482      LDX     LIST7         BUFFER ADDR                                             S03 05155
                    5483 *                                                                                  S03 05156
014266 024046 A     5484 LIST4  LDB     LIST9       ADDR OF NEXT ROM FIELD                                  S03 05157
014267 026000 A     5485      LDB     0,2           NEXT ROM FIELD                                          S03 05158
014270 002000 A     5486      JMPM    OHA           CONVERT TO ASCII                                        S03 05159
014271 014560 R
014272 005144 A     5487      IXR                   SPACE AFTER DATA                                        S03 05160
014273 044041 A     5488      INR     LIST9         STEP TO NEXT FIELD                                      S03 05161
014274 014037 A     5489      LDA     LIST8         FIELD COUNT                                             S03 05162
014275 005311 A     5490      DAR                                                                           S03 05163
014276 054035 A     5491      STA     LIST8         DECREMENTED COUNT                                       S03 05164
014277 001002 A     5492      JAP     LIST4         LOOP IF NOT COMPLETE                                    S03 05165
014300 014266 R
014301 002000 A     5493      CALL    LOOUT,27,BUFR   OUTPUT DATA TO LO                                     S03 05166
014302 015470 R
014303 000033 A
014304 000200 R
014305 001000 A     5494      JMP*    LIST3         RETURN                                                  S03 05167
014306 114262 R
014307 006030 A     5495 LIST5  LDXI   LISTC+6      LOCATION TO STORE ADDRESS                               S03 05168
014310 014430 R
014311 006020 A     5496      LDBI    DROM                                                                  S03 05169
014312 000546 R
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014313 026057 A 5497          LDB     NROM,2          GET NEXT CCS ADDRESS                    S03 05170
014314 002000 A 5498          CALL    OH              CONVERT TO ASCII                        S03 05171
014315 014514 R
014316 002000 A 5499          JMPM    SPAC                                                    S03 05172
014317 014747 R
014320 017000 I 5500          LDA     CPAG            CURRENT PAGE                            S03 05173
014321 006120 A 5501          ADDI    0260                                                    S03 05174
014322 000260 A
014323 054112 A 5502          STA     LISTC+12                                                S03 05175
014324 002000 A 5503          CALL    LOOUT,13,LISTC                                          S03 05176
014325 015470 R
014326 000015 A
014327 014422 R
014330 001000 A 5504          JMP*    LIST                                                    S03 05177
014331 114175 R
               5505 *                                                                         S03 05178
014332 000546 R. 5506 LIST6   DATA    DROM            ADDR OF FIRST ROM FIELD                 S03 05179
014333 000202 R 5507 LIST7    DATA    BUFR+2          OUTPUT BUFFER ADDRESS                   S03 05180
014334 000000 A 5508 LIST8    DATA    0               ROM FIELD CONVERSION COUNT              S03 05181
014335 000000 A 5509 LIST9    DATA    0               ADDR OF ROM FIELD TO CONVERT            S03 05182
014336 120240 A 5510 LISTA    DATA    '    TS  AF  MS  MT  FS  TF  SF'                        S03 05183
014337 120240 A
014340 152323 A
014341 120240 A
014342 140706 A
014343 120240 A
014344 146723 A
014345 120240 A
014346 146724 A
014347 120240 A
014350 143323 A
014351 120240 A
014352 152306 A
014353 120240 A
014354 151706 A
014355 120240 A 5511          DATA    '  GF  MR  AB  IM  LB  LA'                          S03 05184
014356 143706 A
014357 120240 A
014360 146722 A
014361 120240 A
014362 140702 A
014363 120240 A
014364 144715 A
014365 120240 A
014366 146302 A
014367 120240 A
014370 146301 A
014371 120240 A 5512 LISTB    DATA    '   RF  FF  MF  CF  WR  SC'                          S03 05185
014372 120240 A
014373 151306 A
014374 120240 A
014375 143306 A
014376 120240 A
014377 146706 A
014400 120240 A
014401 141706 A
014402 120240 A
014403 153722 A
014404 120240 A
014405 151703 A
014406 120240 A 5513          DATA    '  VF  WF  XF  SH  BB  AA'                          S03 05186
014407 153306 A
014410 120240 A
014411 153706 A
014412 120240 A
014413 154306 A
014414 120240 A
014415 151710 A
014416 120240 A
014417 141302 A
014420 120240 A
014421 140701 A
014422 120240 A 5514 LISTC    DATA    '  CCS LOC   DDDD   PAGE DD'                         S03 05187
014423 141703 A
014424 151640 A
014425 146317 A
014426 141640 A
014427 120240 A
014430 142304 A
014431 142304 A
014432 120240 A
014433 120320 A
014434 140707 A
014435 142640 A
014436 142304 A
               5515          EJEC                                                           S03 05188
               5516 *                                                                       S03 05189
               5517 *        MOVE WORD SUBROUTINE                                           S03 05190
               5518 *        IF THE 'TO' AREA OVERLAPS THE 'FROM' AREA                      S03 05191
               5519 *        IT WILL MOVE IN A REVERSE ORDER                                S03 05192
               5520 *        CALLING SEQUENCE                                               S03 05193
               5521 *        JMPM    MOVW                                                   S03 05194
               5522 *        DATA    COUNT                                                  S03 05195
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                    5523 *      DATA    FROM ADDRESS                                                    S03 05196
                    5524 *      DATA    TO ADDRESS                                                      S03 05197
                    5525 *      RETURN                                                                  S03 05198
                    5526 *                                                                              S03 05199
014437 034050 A     5527 MOV1   LDX     MOVW                                                            S03 05200
014440 015001 A     5528        LDA     1,1         GET 'FROM' ADDRESS                                  S03 05201
014441 145002 A     5529        SUB     2,1         SUBTRACT 'TO' ADDRESS                               S03 05202
014442 001004 A     5530        JAN     MOVR        JUMP IF REVERSE MOVE                                S03 05203
014443 014462 R
                    5531 *      FORWARD MOVE                                                            S03 05204
014444 025001 A     5532        LDB     1,1         GET 'FROM' ADDRESS                                  S03 05205
014445 015000 A     5533        LDA     0,1         GET COUNT                                           S03 05206
014446 035002 A     5534        LDX     2,1         GET 'TO' ADDRESS                                    S03 05207
014447 005311 A     5535 MOV2   DAR                 DECREMENT COUNT                                     S03 05208
014450 001004 A     5536        JAN     MOVE        JUMP IF END OF COUNT                                S03 05209
014451 014504 R
014452 054040 A     5537        STA     MOVC                                                            S03 05210
014453 016000 A     5538        LDA     0,2                                                             S03 05211
014454 055000 A     5539        STA     0,1                                                             S03 05212
014455 005122 A     5540        IBR                                                                     S03 05213
014456 005144 A     5541        IXR                                                                     S03 05214
014457 014033 A     5542        LDA     MOVC        GET COUNT                                           S03 05215
014460 001000 A     5543        JMP     MOV2        KEEP TRYING                                         S03 05216
014461 014447 R
                    5544 *      REVERSE MOVE                                                            S03 05217
014462 015000 A     5545 MOVR   LDA     0,1         GET COUNT                                           S03 05218
014463 125001 A     5546        ADD     1,1         ADD 'FROM' ADDRESS                                  S03 05219
014464 005012 A     5547        TAB                                                                     S03 05220
014465 015000 A     5548        LDA     0,1         GET COUNT                                           S03 05221
014466 054024 A     5549        STA     MOVC        SAVE                                                S03 05222
014467 125002 A     5550        ADD     2,1         ADD 'TO' ADDRESS                                    S03 05223
014470 005014 A     5551        TAX                                                                     S03 05224
014471 014021 A     5552 MOV3   LDA     MOVC                                                            S03 05225
014472 005311 A     5553        DAR                 DECREMENT COUNT                                     S03 05226
014473 001004 A     5554        JAN     MOVE        JUMP IF END OF COUNT                                S03 05227
014474 014504 R
014475 054015 A     5555        STA     MOVC                                                            S03 05228
014476 005322 A     5556        DBR                                                                     S03 05229
014477 005344 A     5557        DXR                                                                     S03 05230
014500 016000 A     5558        LDA     0,2                                                             S03 05231
014501 055000 A     5559        STA     0,1                                                             S03 05232
014502 001000 A     5560        JMP     MOV3        KEEP TRYING                                         S03 05233
014503 014471 R
                    5561 *                                                                              S03 05234
014504 044003 A     5562 MOVE   INR     MOVW        ADJUST                                              S03 05235
014505 044002 A     5563        INR     MOVW        RETURN                                              S03 05236
014506 044001 A     5564        INR     MOVW        ADDRESS                                             S03 05237
014507 001000 A     5565        JMP     0           RETURN                                              S03 05238
014510 000000 A
                    5566 *                                                                              S03 05239
                    5567 *      ENTRY POINT                                                             S03 05240
                    5568 *                                                                              S03 05241
014510              5569 MOVW   BES     0           ENTRY                                               S03 05242
014511 001000 A     5570        JMP     MOV1                                                            S03 05243
014512 014437 R
014513 000000 A     5571 MOVC   DATA    0           TEMP STORAGE FOR MOVW                               S03 05244
                    5572        EJEC                                                                    S03 05245
                    5573 *                                                                              S03 05246
                    5574 *      THIS IS A SUBROUTINE TO CONVERT THE NUMBER IN THE B REGISTER            S03 05247
                    5575 *      INTO 4 HEXADECIMAL CHAR'S AND STORE THEM IN LOC.                        S03 05248
                    5576 *      INDEXED BY X                                                            S03 05249
                    5577 *                                                                              S03 05250
                    5578 *      CALLING SEQUENCE                                                        S03 05251
                    5579 *      LDX     ADDR OF ASCII CHAR STRING                                       S03 05252
                    5580 *      LDB     BINARY NUMBER                                                   S03 05253
                    5581 *      JMPM    DH                                                              S03 05254
                    5582 *      RETURN                                                                  S03 05255
                    5583 *                                                                              S03 05256
                    5584 *                                                                              S03 05257
                    5585 *                                                                              S03 05258
                    5586 *      ENTRY POINT                                                             S03 05259
014514 000000 A     5587 DH     ENTR                                                                    S03 05260
014515 002000 A     5588        JMPM    DH2         CONVERT FIRST CHAR                                  S03 05261
014516 014541 R
014517 004250 A     5589        LRLA    8           SAVE                                                S03 05262
014520 055000 A     5590        STA     0,1                                                             S03 05263
014521 002000 A     5591        JMPM    DH2         CONVERT SECOND CHAR                                 S03 05264
014522 014541 R
014523 115000 A     5592        DRA     0,1         ADD TO FIRST CHAR                                   S03 05265
014524 055000 A     5593        STA     0,1         STORE IN BUFFER                                     S03 05266
014525 005144 A     5594        IXR                                                                     S03 05267
014526 002000 A     5595        JMPM    DH2         CONVERT THIRD CHAR                                  S03 05268
014527 014541 R
014530 004250 A     5596        LRLA    8                                                               S03 05269
014531 055000 A     5597        STA     0,1                                                             S03 05270
014532 002000 A     5598        JMPM    DH2         CONVERT FOURTH CHAR                                 S03 05271
014533 014541 R
014534 115000 A     5599        DRA     0,1         ADD TO THIRD CHAR                                   S03 05272
014535 055000 A     5600        STA     0,1         STORE IN BUFFER                                     S03 05273
014536 005144 A     5601        IXR                                                                     S03 05274
014537 001000 A     5602        JMP*    DH          RETURN                                              S03 05275
014540 114514 R
                    5603 *                                                                              S03 05276
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014541 000000 A 5604 DH2     ENTR                                                    S03 05277
014542 005001 A 5605         TZA                                                     S03 05278
014543 004444 A 5606         LLRL    4              NEXT 4-BIT DIGIT                 S03 05279
014544 006140 A 5607         SUBI    012                                             S03 05280
014545 000012 A
014546 001004 A 5608         JAN     *+4            JUMP IF 0-9                      S03 05281
014547 014552 R
014550 006120 A 5609         ADDI    07             A-F                              S03 05282
014551 000007 A
014552 006120 A 5610         ADDI    012                                             S03 05283
014553 000012 A
014554 006120 A 5611         ADDI    0260           CONVERT TO ASCII                 S03 05284
014555 000260 A
014556 001000 A 5612       . JMP*    DH2            RETURN                           S03 05285
014557 114541 R
               5613 *                                                                S03 05286
               5614          EJEC                                                    S03 05287
               5615 *                                                                S03 05288
               5616 *        THIS ROUTINE WILL CONVERT THE TWO RIGHT-JUSTIFIED       S03 05289
               5617 *        DIGITS IN THE B REGISTER INTO HEX ASCII AND STORE       S03 05290
               5618 *        THEM IN THE LOCATION INDEXED BY X                       S03 05291
               5619 *                                                                S03 05292
               5620 *        CALLING SEQUENCE                                        S03 05293
               5621 *        LDB     DIGITS TO BE CONVERTED                          S03 05294
               5622 *        LDX     ADDR OF ASCII DATA STRING                       S03 05295
               5623 *        JMPM    DHA                                             S03 05296
               5624 *                                                                S03 05297
               5625 *        RETURN                                                  S03 05298
               5626 *                                                                S03 05299
014560 000000 A 5627 DHA     ENTR                                                    S03 05300
014561 004050 A 5628         LRLB    8              LEFT-JUSTIFY DIGITS              S03 05301
014562 002000 A 5629         JMPM    DH2            CONVERT FIRST DIGIT              S03 05302
014563 014541 R
014564 004250 A 5630         LRLA    8              POSITION DIGIT                   S03 05303
014565 055000 A 5631         STA     0,1                                             S03 05304
014566 002000 A 5632         JMPM    DH2            CONVERT SECOND DIGIT             S03 05305
014567 014541 R
014570 115000 A 5633         ORA     0,1            ADD TO FIRST                     S03 05306
014571 055000 A 5634         STA     0,1                                             S03 05307
014572 005144 A 5635         IXR                    STEP DATA STRING INDEX           S03 05308
014573 001000 A 5636         JMP*    DHA            RETURN                           S03 05309
014574 114560 R
               5637          EJEC                                                    S03 05310
               5638 *                                                                S03 05311
               5639 *        THIS ROUTINE WILL INITIALIZE THE LD OUTPUT BUFFER       S03 05312
               5640 *                                                                S03 05313
               5641 *        CALLING SEQUENCE                                        S03 05314
               5642 *        JMPM    PBUF                                            S03 05315
               5643 *                                                                S03 05316
               5644 *        RETURN                                                  S03 05317
               5645 *                                                                S03 05318
014575 000000 A 5646 PBUF    ENTR                                                    S03 05319
014576 006010 A 5647         LDAI    0120240        ASCII SPACES                     S03 05320
014577 120240 A
014600 002000 A 5648         JMPM    SAR            INITIALIZE BUFFER                S03 05321
014601 014702 R
014602 000044 A 5649         DATA    36             WORD COUNT                       S03 05322
014603 000200 R 5650         DATA    BUFR           BUFFER ADDR                      S03 05323
014604 001000 A 5651         JMP*    PBUF           RETURN                           S03 05324
014605 114575 R
               5652          EJEC                                                    S03 05325
               5653 *                                                                S03 05326
               5654 *        THIS ROUTINE WILL DUMP THE CONTENTS OF THE              S03 05327
               5655 *        PSEUDO-REGS TO THE LD AS PART OF THE TRACE FUNCTION     S03 05328
               5656 *                                                                S03 05329
               5657 *        CALLED BY DATA LOOP PROCESSING COMPONENT - S300         S03 05330
               5658 *                                                                S03 05331
               5659 *                                                                S03 05332
               5660 *        MESSAGE FORMAT IS AS FOLLOWS                            S03 05333
               5661 *        R0  DDDD  R1  DDDD  R2  DDDD  R3  DDDD                  S03 05334
               5662 *        R4  DDDD  R5  DDDD  R6  DDDD  R7  DDDD                  S03 05335
               5663 *        R8  DDDD  R9  DDDD  RA  DDDD  RB  DDDD                  S03 05336
               5664 *        RC  DDDD  RD  DDDD  RE  DDDD  RF  DDDD                  S03 05337
               5665 *                                                                S03 05338
               5666 *                                                                S03 05339
               5667 *        CALLING SEQUENCE                                        S03 05340
               5668 *        JMPM    REGS                                            S03 05341
               5669 *                                                                S03 05342
               5670 *        RETURN                                                  S03 05343
               5671 *                                                                S03 05344
014606 000000 A 5672 REG$    ENTR                                                    S03 05345
014607 005001 A 5673         TZA                                                     S03 05346
014610 054050 A 5674         STA     REG6           START WITH REG ZERO              S03 05347
               5675 *                                                                S03 05348
014611 002000 A 5676         JMPM    SPAC           SPACE LD                         S03 05349
014612 014747 R
014613 002000 A 5677 REG1    JMPM    PBUF           INITIALIZE LD BUFFER             S03 05350
014614 014575 R
014615 034045 A 5678         LDX     REG8           ADDR OF LD BUFFER                S03 05351
               5679 *                                                                S03 05352
014616 024042 A 5680 REG2    LDB     REG6           REGISTER NUMBER                  S03 05353
014617 004054 A 5681         LRLB    12             LEFT JUSTIFIED                   S03 05354
014620 002000 A 5682         JMPM    DH2            CONVERT TO ASCII                 S03 05355
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014621 014541 R
014622 006110 A 5683          ORAI    0151000         ADD AN R                                  $03 05356
014623 151000 A
014624 055000 A 5684          STA     0,1             STORE IN LO BUFFER                        $03 05357
014625 005144 A 5685          IXR                                                               $03 05358
014626 005144 A 5686          IXR                                                               $03 05359
014627 014031 A 5687          LDA     REG6            REGISTER NUMBER                           $03 05360
014630 124031 A 5688          ADD     REG7            PLUS ADDR OF REGISTERS                    $03 05361
014631 005012 A 5689          TAB                                                               $03 05362
014632 026000 A 5690          LDB     0,2             REGISTER CONTENTS                         $03 05363
014633 002000 A 5691          JMPM    OH              CONVERT TO ASCII IN LO                    $03 05364
014634 014514 R
014635 005144 A 5692          IXR                                                               $03 05365
                5693 *                                                                          $03 05366
014636 044022 A 5694          INR     REG6            STEP REGISTER NUMBER                      $03 05367
014637 014021 A 5695          LDA     REG6            REGISTER NUMBER                           $03 05368
014640 006150 A 5696          ANAI    03              LSB'S OF NO                               $03 05369
014641 000003 A
014642 001010 A 5697          JAZ     *+4             JUMP IF END OF LINE                       $03 05370
014643 014646 R
014644 001000 A 5698          JMP     REG2            CONVERT NEXT REGISTER                     $03 05371
014645 014616 R
014646 002000 A 5699          CALL    LOOUT,21,BUFR   OUTPUT LINE                               $03 05372
014647 015470 R
014650 000025 A
014651 000200 R
014652 014006 A 5700 REG3     LDA     REG6            REG NUMBER                                $03 05373
014653 006140 A 5701          SUBI    020             REGISTER LIMIT                            $03 05374
014654 000020 A
014655 001010 A 5702          JAZ*    REGS            RETURN IF DONE                            $03 05375
014656 114606 R
014657 001000 A 5703          JMP     REG1            OUTPUT NEXT LINE                          $03 05376
014660 014613 R
                5704 *                                                                          $03 05377
014661 000000 A 5705 REG6     DATA    0               REGISTER NUMBER                           $03 05378
014662 000526 R 5706 REG7     DATA    R0              ADDR OF FIRST REGISTER                    $03 05379
014663 000202 R 5707 REG8     DATA    BUFR+2          ADDR OF LO BUFFER                         $03 05380
                5708          EJEC                                                              $03 05381
                5709 *                                                                          $03 05382
                5710 *        THIS IS A SUBROUTINE TO STORE THE A-REGISTER REPEATEDLY           $03 05383
                5711 *        CALLING SEQUENCE                                                  $03 05384
                5712 *        JMPM    SAR                                                       $03 05385
                5713 *        DATA    COUNT                                                     $03 05386
                5714 *        DATA    DATA ADDRESS                                              $03 05387
                5715 *        RETURN                                                            $03 05388
                5716 *                                                                          $03 05389
014664 034015 A 5717 SAR1     LDX     SAR             GET ADDRESS OF CALL                       $03 05390
014665 005012 A 5718          TAB                     PUT A-REG. INTO B-REG.                    $03 05391
014666 015000 A 5719          LDA     0,X             GET COUNT                                 $03 05392
014667 035001 A 5720          LDX     1,X             GET DATA ADDRESS                          $03 05393
014670 005311 A 5721 SAR2     DAR                     DECREMENT COUNT                           $03 05394
014671 001004 A 5722          JAN     SAR3            JUMP IF END OF COUNT                      $03 05395
014672 014677 R
014673 065000 A 5723          STB     0,X             STORE 'A-REGISTER'                        $03 05396
014674 005144 A 5724          IXR                     INCREMENT DATA ADDRESS                    $03 05397
014675 001000 A 5725          JMP     SAR2            KEEP TRYING                               $03 05398
014676 014670 R
                5726 *                                                                          $03 05399
014677 044002 A 5727 SAR3     INR     SAR             ADJUST                                    $03 05400
014700 044001 A 5728          INR     SAR             RETURN ADDRESS                            $03 05401
014701 001000 A 5729          JMP     0               RETURN                                    $03 05402
014702 000000 A
                5730 *                                                                          $03 05403
                5731 *        ENTRY POINT                                                       $03 05404
                5732 *                                                                          $03 05405
014702          5733 SAR      BES     0               ENTRY                                     $03 05406
014703 001000 A 5734          JMP     SAR1                                                      $03 05407
014704 014664 R
                5735          EJEC                                                              $03 05408
                5736 *                                                                          $03 05409
                5737 *        THIS IS A SUBROUTINE TO CHECK IF THE CONTROL STORE ADDRESS IS      $03 05410
                5738 *        WITHIN THE GIVEN TRACE BOUNDARIES                                 $03 05411
                5739 *                                                                          $03 05412
                5740 *        CALLING SEQUENCE                                                  $03 05413
                5741 *        JMPM    TRSET                                                     $03 05414
                5742 *        RETURN                  A REG POS-DO TRACE   A REG NEG-NO TRACE   $03 05415
                5743 *                                                                          $03 05416
014705 014036 A 5744 TRD      LDA     TRSET                                                     $03 05417
014706 054006 A 5745          STA     TRSETA          SET RETURN                                $03 05418
014707 006030 A 5746          LDXI    DROM                                                      $03 05419
014710 000546 R
014711 015057 A 5747          LDA     NROM,1          NEXT CCS ADDR                         D   03 05420
014712 055045 A 5748          STA     FIL1,1          SAVE CURRENT CCS ADDR                 D   03 05421
014713 001000 A 5749          JMP     TRC                                                       03 05422
014714 014720 R
014715 000000 A 5750 TRSETA   ENTR                    SUBSEQUENT ENTRY                          03 05423
014716 006030 A 5751          LDXI    DROM                                                  D   03 05424
014717 000546 R
014720 027000 I 5752 TRC      LDB     PPAG            CURRENT PAGE AT START OF MICRO          E.2*******
014721 006016 A 5753          LDAE    TRACE,2                                                 E.2*******
014722 000478 R
014723 001010 A 5754          JAZ     TRE             IF TRACE IS OFF FOR THE CURRENT PAGE    E.2*******
014724 01474. R
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014725 015045 A 5755         LDA     FIL1,1          CURRENT CCS ADDR                                  E.2********
014726 006146 A 5756         SUBE    STRTRC,2        AT OR BEYOND START TRACE ADDR FOR PAGE D    03 05427
014727 012126 R
014730 001004 A 5757         JAN*    TRSETA          NO-SET TRACE TO END ADDR                  D    03 05428
014731 114715 R
014732 006016 A 5758 TRA     LDAE    ENDTRC,2        END TRACE ADDR FOR PAGE                   D    03 05429
014733 012132 R
014734 145045 A 5759         SUB     FIL1,1          CCS ADDRESS                                       S03 05430
014735 001004 A 5760         JAN*    TRSETA          YES-DO NOT TRACE                                  S03 05431
014736 114715 R
014737 001000 A 5761         JMP*    TRSETA          RETURN                                            S03 05432
014740 114715 R
014741 005301 A 5762 TRE     DECR    01              SET FOR NO TRACE                                  E.2********
014742 001000 A 5763         JMP*    TRSETA          RETURN                                            E.2********
014743 114715 R
014744 000000 A 5764 TRSET   ENTR                     INITIAL ENTRY FOR EACH CCS WORD                   S03 05433
014745 001000 A. 5765        JMP     TRD                                                               S03 05434
014746 014705 R
                5766         EJEC                                                                      S03 05435
                5767 *                                                                                 S03 05436
                5768 *       THIS ROUTINE WILL SPACE THE LO                                            S03 05437
                5769 *                                                                                 S03 05438
                5770 *       CALLING SEQUENCE                                                          S03 05439
                5771 *       JMPM    SPAC                                                              S03 05440
                5772 *                                                                                 S03 05441
                5773 *       RETURN                                                                    S03 05442
                5774 *                                                                                 S03 05443
014747 000000 A 5775 SPAC    ENTR                                                                      S03 05444
014750 002000 A 5776         CALL    PBUF            CLEAR OUTPUT BUFFER                               S03 05445
014751 014575 R
014752 002000 A 5777         CALL    LOOUT,36,BUFR     SPACE LO                                        S03 05446
014753 015470 R
014754 000044 A
014755 000200 R
014756 001000 A 5778         JMP*    SPAC            RETURN                                            S03 05447
014757 114747 R
                5779 *                                                                                 S03 05448
                5780         EJEC                                                                      S03 05449
                5781 *                                                                                 S03 05450
                5782 *       THIS ROUTINE HANDLES TOP OF FORM AND STANDARD HEADER OUTPUT               S03 05451
                5783 *                                                                                 S03 05452
                5784 *       CALLING SEQUENCE                                                          S03 05453
                5785 *       CALL    TPFRM                                                             S03 05454
                5786 *       RETURN                                                                    S03 05455
                5787 *                                                                                 S03 05456
014760 000000 A 5788 TPFRM   ENTR                                                                      S03 05457
                5789         FUNC    LODCB,LO,0                                                        S03 05458
014761 002000 A
014762 012470 E
014763 100000 A
014764 002405 A
014765 015600 R
014766 000000 A
014767 000000 A
014770 014121 A 5790         LDA     PGNO            PAGE NUMBER                                       S03 05459
014771 002000 A 5791         CALL    BNASC                                                             S03 05460
014772 015130 R
014773 054061 A 5792         STA     HDR+4                                                             S03 05461
014774 064061 A 5793         STB     HDR+5                                                             S03 05462
014775 024115 A 5794         LDB     DATE                                                              S03 05463
014776 026000 A 5795         LDB     0,2                                                               S03 05464
014777 036000 A 5796         LDX     0,2                                                               S03 05465
015000 006020 A 5797         LDBI    HDR+7           HEADER AREA                                       S03 05466
015001 015060 R
015002 002000 A 5798         JMPM    TPST            STORE                                             S03 05467
015003 015115 R
015004 024107 A 5799         LDB     JOB                                                               S03 05468
015005 026000 A 5800         LDB     0,2                                                               S03 05469
015006 036000 A 5801         LDX     0,2                                                               S03 05470
015007 006020 A 5802         LDBI    HDR+12          HEADER AREA                                       S03 05471
015010 015065 R
015011 002000 A 5803         JMPM    TPST            STORE                                             S03 05472
015012 015115 R
015013 027000 I 5804         LDB     SYST                                                              S03 05473
015014 016000 A 5805         LDA     0,2             SYSTEM FLAG                                       S03 05474
015015 001010 A 5806         JAZ     *+6             VORTEX                                            S03 05475
015016 015023 R
015017 006030 A 5807         LDXI    TPMOS           MOS                                               S03 05476
015020 015102 R
015021 001000 A 5808         JMP     *+4                                                               S03 05477
015022 015025 R
015023 006030 A 5809         LDXI    TPVOR           VORTEX                                            S03 05478
015024 015106 R
015025 006020 A 5810         LDBI    HDR+17          HEADER AREA                                       S03 05479
015026 015072 R
015027 002000 A 5811         JMPM    TPST            STORE                                             S03 05480
015030 015115 R
015031 006010 A 5812         LDAI    1                                                                 S03 05481
015032 000001 A
015033 054557 A 5813         STA     LOLINE          RESET LINE NUMBER                                 S03 05482
015034 002000 A 5814         CALL    LOOUT,25,HDR      OUTPUT HEADER                                   S03 05483
015035 015470 R
015036 000031 A
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015037 015051 R
015040 002000 A 5815          JMPM    PBUF            CLEAR OUTPUT BUFFER                    S03 05484
015041 014575 R
015042 002000 A 5816          CALL    LDOUT,1,BUFR    SPACE LD                               S03 05485
015043 015470 R
015044 000001 A
015045 000200 R
015046 044043 A 5817          INR     PGNO            INCR PAGE NUMBER                       S03 05486
015047 001000 A 5818          RETU*   TPFRM                                                  S03 05487
015050 114760 R
                5819 *                                                                       S03 05488
015051 120240 A 5820 HDR      DATA    '  PAGE  DDDD  MM/DD/YY  JOBNAME    SYSTEM   MICSIM'  S03 05489
015052 150301 A
015053 143705 A
015054 120240 A
015055 142304 A
015056 142304 A
015057 120240 A
015060 146715 A
015061 127704 A
015062 142257 A
015063 154731 A
015064 120240 A
015065 145317 A
015066 141316 A
015067 140715 A
015070 142640 A
015071 120240 A
015072 120323 A
015073 154723 A
015074 152305 A
015075 146640 A
015076 120240 A
015077 146711 A
015100 141723 A
015101 144715 A
015102 120240 A 5821 TPMOS   DATA    '  MOS   '                                             S03 05490
015103 146717 A
015104 151640 A
015105 120240 A
                5822          IFF     VORTEX-2                                       V2  03 05491
                5823 TPVOR    DATA    ' VORTXII'                                     V2  03 05492
                5824          IFF     VORTEX-1                                       V2  03 05493
015106 120326 A 5825 TPVOR    DATA    ' VORTEX '                                         S03 05494
015107 147722 A
015110 152305 A
015111 154240 A
015112 000000 A 5826 PGNO     DATA    0               CURRENT PAGE NUMBER                    S03 05495
                5827          EXT     $DATE                                                  S03 05496
                5828          EXT     $JOB                                                   S03 05497
015113 100000 E 5829 DATE     DATA    ($DATE)*                                               S03 05498
015114 100000 E 5830 JOB      DATA    ($JOB)*                                                S03 05499
                5831 *                                                                       S03 05500
015115 000000 A 5832 TPST     ENTR                                                           S03 05501
015116 015000 A 5833          LDA     0,1             CHAR 1-2                               S03 05502
015117 056000 A 5834          STA     0,2                                                    S03 05503
015120 015001 A 5835          LDA     1,1             CHAR 3-4                               S03 05504
015121 056001 A 5836          STA     1,2                                                    S03 05505
015122 015002 A 5837          LDA     2,1             CHAR 5-6                               S03 05506
015123 056002 A 5838          STA     2,2                                                    S03 05507
015124 015003 A 5839          LDA     3,1             CHAR 7-8                               S03 05508
015125 056003 A 5840          STA     3,2                                                    S03 05509
015126 001000 A 5841          JMP*    TPST                                                   S03 05510
015127 115115 R
                5842          EJEC                                                           S03 05511
                5843 *                                                                       S03 05512
                5844 *        CONVERT CONTENTS OF A REG TO ASCII DEVIMAL                     S03 05513
                5845 *                                                                       S03 05514
                5846 *        CALLING SEQUENCE                                               S03 05515
                5847 *        LDA     BINARY                                                 S03 05516
                5848 *        CALL    BNASC                                                  S03 05517
                5849 *        RETURN RESULTS IN A AND B                                      S03 05518
                5850 *                                                                       S03 05519
015130 000000 A 5851 BNASC    ENTR                                                           S03 05520
015131 006030 A 5852          LDXI    TABL+8          INITIALIZE POINTER                     S03 05521
015132 015215 R
015133 054052 A 5853          STA     PUT                                                    S03 05522
015134 005002 A 5854          TZB                     ZERO ACCUM                             S03 05523
015135 014050 A 5855          LDA     PUT             GET REMAINDER                          S03 05524
015136 145000 A 5856 GET      SUB     0,1             DIVIDE BY SUB                          S03 05525
015137 001004 A 5857          JAN     GET2            EXIT IF NEG                            S03 05526
015140 015144 R
015141 005122 A 5858          IBR                     INCR RESULT                            S03 05527
015142 001000 A 5859          JMP     GET                                                    S03 05528
015143 015136 R
015144 125000 A 5860 GET2     ADD     0,1             ADD BACK DIVISOR                       S03 05529
015145 054040 A 5861          STA     PUT             SAVE REMAINDER                         S03 05530
015146 005021 A 5862          TBA                     CONVERT RESULT TO ASCII                S03 05531
015147 124047 A 5863          ADD     ZEROB                                                  S03 05532
015150 055001 A 5864          STA     1,1                                                    S03 05533
015151 005344 A 5865          DXR                                                            S03 05534
015152 005344 A 5866          DXR                     ARE WE THRU                            S03 05535
015153 005041 A 5867          TXA                                                            S03 05536
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015154 006140 A 5868          SUBI    TABL                                                    S03 05537
015155 015205 R
015156 001010 A 5869          JAZ     *+4             YES                                     S03 05538
015157 015162 R
015160 001000 A 5870          JMP     GET-2           NO                                      S03 05539
015161 015134 R
015162 014023 A 5871          LDA     PUT             CONVERT UNITS TO ASCII                  S03 05540
015163 124033 A 5872          ADD     ZEROB                                                   S03 05541
015164 054021 A 5873          STA     PUT                                                     S03 05542
015165 006030 A 5874          LDXI    PUT             ASSEMBLE 4 ASCII CHAR                   S03 05543
015166 015206 R
015167 007401 A 5875          SOF                                                             S03 05544
015170 015002 A 5876 PUTLP    LDA     2,1                                                     S03 05545
015171 004250 A 5877          LRLA    8                                                       S03 05546
015172 115000 A 5878          ORA     0,1                                                     S03 05547
015173 001001 A 5879          JOF     *+4             MORE ?                                  S03 05548
015174 015177 R
015175 001000 A 5880          RETU*   BNASC           NO-RETURN                               S03 05549
015176 115130 R
015177 005012 A 5881          TAB                                                             S03 05550
015200 007400 A 5882          ROF                                                             S03 05551
015201 006030 A 5883          LDXI    PUT+4                                                   S03 05552
015202 015212 R
015203 001000 A 5884          JMP     PUTLP           DO AGAIN                                S03 05553
015204 015170 R
015205 000001 A 5885 TABL     DATA    1                                                       S03 05554
015206 000000 A 5886 PUT      DATA    0               STORAGE                                 S03 05555
015207 000012 A 5887          DATA    10,0,100,0,1000,0,10000,0                               S03 05556
015210 000000 A
015211 000144 A
015212 000000 A
015213 001750 A
015214 000000 A
015215 023420 A
015216 000000 A
015217 000260 A 5888 ZEROB    DATA    0260            ASCII ZERO                              S03 05557
                5889          EJEC                                                            S03 05558
                5890 *                                                                        S03 05559
                5891 *        THIS IS A SUBROUTINE TO READ AN RECORD FROM THE SI DEVICE       S03 05560
                5892 *                                                                        S03 05561
                5893 *        CALLING SEQUENCE                                                S03 05562
                5894 *        CALL    SIIN                                                    S03 05563
                5895 *        RETURN  A,B,X REGISTERS RESTORED                                S03 05564
                5896 *                                                                        S03 05565
015220 000000 A 5897 SIIN     ENTR                                                            S03 05566
015221 006017 A 5898          LDAE    MEDIA                                                   S03 05567
015222 012527 R
015223 001010 A 5899          JAZ     SIIN2           JUMP IF MEDIA = SI                      S03 05568
015224 015235 R
015225 006017 A 5900          LDAE    SIIN                                                    S03 05569
015226 015220 R
015227 054072 A 5901          STA     PIIN            SET UP RETURN ADDRESS                   S03 05570
015230 001000 A 5902          JMP     PIIN+1          GO TO READ FROM PI                      S03 05571
015231 015323 R
015232 054064 A 5903          STA     SIINA                                                   S03 05572
015233 064064 A 5904          STB     SIINB                                                   S03 05573
015234 074064 A 5905          STX     SIINX                                                   S03 05574
015235 006027 A 5906 SIIN2    LDBE    SYST            SYSTEM FLAG ADDR                        S03 05575
015236 001401 R
015237 016000 A 5907          LDA     0,2                                                     S03 05576
015240 001004 A 5908          JAN     SIIN3           JUMP IF MOS                             S03 05577
015241 015252 R
015242 014053 A 5909          LDA     SIFLG                                                   S03 05578
015243 001002 A 5910          JAP     SIIN3           JUMP IF NON-RMD                         S03 05579
015244 015252 R
                5911          IOLINK  2,BUFI,36                                               S03 05580
015245 002000 A
015246 010757 E
015247 001402 A
015250 000375 R
015251 000044 A
015252 006010 A 5912 SIIN3    LDAI    0120240         BLANK-BLANK                             S03 05581
015253 120240 A
015254 002000 A 5913          JMPM    SAR             INITIALIZE INPUT BUFFER TO BLANKS       S03 05582
015255 014702 R
015256 000044 A 5914          DATA    36                                                      S03 05583
015257 000374 R 5915          DATA    BUFI-1                                                  S03 05584
                5916 SIIN1    READ    INDCB,SI,0,1    READ INPUT                              S03 05585
015260 002000 A
015261 014762 E
015262 100000 A
015263 010002 A
015264 015313 R
015265 000000 A
015266 000000 A
                5917 SI1      STAT    SIIN1,SI2,E171,SI2,SI1                          C.1 03 05586
015267 002000 A
015270 010775 E
015271 015260 R
015272 015276 R
015273 012463 R
015274 015276 R
015275 015267 R
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015276           5918 SI2     BSS     0                                                    C.1 03 05587
015276 002000 A  5919         JMPM    SOELO          SO = LO ?                               C 03 05588
015277 015614 R
015300 001010 A  5920         JAZ     SIRTN          IF YES, BYPASS LOOUT                    C 03 05589
015301 015306 R
015302 002000 A  5921 SILO    CALL    LOOUT,36,BUFI-1    ECHO TO LO FOR RECORD                  S03 05590
015303 015470 R
015304 000044 A
015305 000374 R
015306 014010 A  5922 SIRTN   LDA     SIINA                                                C 03 05591
015307 024010 A  5923         LDB     SIINB                                                 S03 05592
015310 034010 A  5924         LDX     SIINX                                                 S03 05593
015311 001000 A  5925         RETU*   SIIN           RETURN                                 S03 05594
015312 115220 R
                 5926 INDCB   DCB     36,BUFI,0                                             S03 05595
015313 000044 A
015314 000375 R
015315 000000 A
015316 000000 A  5927 SIFLG   DATA    0              SI ON RMD FLAG                         S03 05596
015317 000000 A  5928 SIINA   DATA    0              A REG                                  S03 05597
015320 000000 A  5929 SIINB   DATA    0              B REG                                  S03 05598
015321 000000 A  5930 SIINX   DATA    0              X REG                                  S03 05599
                 5931         EJEC                                                         S03 05600
                 5932 *                                                                    S03 05601
                 5933 *       THIS IS A SUBROUTINE TO READ A RECORD FROM THE PI DEVICE      S03 05602
                 5934 *                                                                    S03 05603
                 5935 *       CALLING SEQUENCE                                             S03 05604
                 5936 *       CALL    PIIN           NOTE: RECORDS MAY NOT BE BLOCKED ON RMD S03 05605
                 5937 *                                                                    S03 05606
                 5938 *       RETURN: A,B,X REGISTERS RESTORED                             S03 05607
                 5939 *                                                                    S03 05608
015322 000000 A  5940 PIIN    ENTR                                                         S03 05609
015323 054057 A  5941         STA     PIINA                                                S03 05610
015324 064057 A  5942         STB     PIINB                                                S03 05611
015325 074057 A  5943         STX     PIINX                                                S03 05612
015326 027000 I  5944         LDB     SYST           SYSTEM FLAG ADDR                      S03 05613
015327 016000 A  5945         LDA     0,2                                                  S03 05614
015330 001004 A  5946         JAN     PIIN1          JUMP IF MOS                           S03 05615
015331 015342 R
015332 014047 A  5947         LDA     PIFLG                                                S03 05616
015333 001002 A  5948         JAP     PIIN1          JUMP IF ON NON RMD                    S03 05617
015334 015342 R
                 5949         IOLINK  4,BUFI,36                                            S03 05618
015335 002000 A
015336 015246 E
015337 001404 A
015340 000375 R
015341 000044 A
015342 006010 A  5950 PIIN1   LDAI    0120240        BLANK-BLANK                           S03 05619
015343 120240 A
015344 002000 A  5951         JMPM    SAR            INITIALIZE INPUT BUFFER               S03 05620
015345 014702 R
015346 000044 A  5952         DATA    36                                                   S03 05621
015347 000374 R  5953         DATA    BUFI-1                                               S03 05622
                 5954 PIIN2   READ    PIDCB,4,0,1    READ INPUT                            S03 05623
015350 002000 A
015351 015261 E
015352 100000 A
015353 010004 A
015354 015377 R
015355 000000 A
015356 000000 A
                 5955 PI1     STAT    PIIN2,CHMR,CHMR,CHMR,PI1   IF ERR/EOF/BEOD RETURN SI  C.1 03 05624
015357 002000 A
015360 015270 E
015361 015350 R
015362 012523 R
015363 012523 R
015364 012523 R
015365 015357 R
015366 002000 A  5956         CALL    LOOUT,36,BUFI-1    ECHO TO LO FOR RECORD              S03 05625
015367 015470 R
015370 000044 A
015371 000374 R
015372 014010 A  5957         LDA     PIINA                                                S03 05626
015373 024010 A  5958         LDB     PIINB                                                S03 05627
015374 034010 A  5959         LDX     PIINX                                                S03 05628
015375 001000 A  5960         RETU*   PIIN           RETURN                                S03 05629
015376 115322 R
                 5961 *                                                                    S03 05630
                 5962 PIDCB   DCB     36,BUFI,0                                            S03 05631
015377 000044 A
015400 000375 R
015401 000000 A
015402 000000 A  5963 PIFLG   DATA    0              PI ON RMD FLAG, POS=NO, NEG=YES       S03 05632
015403 000000 A  5964 PIINA   DATA    0                                                    S03 05633
015404 000000 A  5965 PIINB   DATA    0                                                    S03 05634
015405 000000 A  5966 PIINX   DATA    0                                                    S03 05635
                 5967         EJEC                                                         S03 05636
                 5968 *                                                                    S03 05637
                 5969 *       THIS IS A SUBROUTINE TO WRITE A RECORD TO THE SO DEVICE       S03 05638
                 5970 *                                                                    S03 05639
                 5971 *       CALLING SEQUENCE                                             S03 05640
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                    5972 *       CALL    SIOUT,A,B                                                  $03 05641
                    5973 *               WHERE:                                                     $03 05642
                    5974 *               A=NUMBER OF WORDS                                          $03 05643
                    5975 *               B=BUFFER ADDRESS                                           $03 05644
                    5976 *                                                                          $03 05645
                    5977 *       RETURN: A,B,X REGISTERS RESTORED                                   $03 05646
                    5978 *                                                                          $03 05647
015406 000000 A     5979 SIOUT   ENTR                                                               $03 05648
015407 054035 A     5980         STA     SIOUA                                                      $03 05649
015410 064035 A     5981         STB     SIOUB                                                      $03 05650
015411 074035 A     5982         STX     SIOUX                                                      $03 05651
015412 037000 I     5983         LDX     SIOUT          ADDRESS OF PARAMS                           $03 05652
015413 015000 A     5984         LDA     0,1            NUMBER OF WORDS                             $03 05653
015414 054045 A     5985         STA     OUDCB          STORE IN DCB                                $03 05654
015415 015001 A     5986         LDA     1,1            BUFFER ADDRESS                              $03 05655
015416 054044 A     5987         STA     OUDCB+1        STORE IN DCB                                $03 05656
                    5988 SIOU1   WRITE   OUDCB,SO,0,1   OUTPUT BUFFER                               $03 05657
015417 002000 A
015420 015351 E
015421 100000 A
015422 010403 A
015423 015462 R
015424 000000 A
015425 000000 A
                    5989 SO1     STAT    SIOU1,SO2,SO2,SO2,SO1                                      C.1 03 05658
015426 002000 A
015427 015360 E
015430 015417 R
015431 015435 R
015432 015435 R
015433 015435 R
015434 015426 R
015435              5990 SO2     BSS     0                                                          C.1 03 05659
015435 002000 A     5991         JMPM    SOELO          SO = LO ?                                     C 03 05660
015436 015614 R
015437 001010 A     5992         JAZ     SORTN          IF YES, BYPASS LOOUT                          C 03 05661
015440 015451 R
015441 014020 A     5993         LDA     OUDCB          REQUESTED WORD COUNT                        $03 05662
015442 054004 A     5994         STA     SOLO+2         OVERLAY WC OF STANDARD CALL                 $03 05663
015443 014017 A     5995         LDA     OUDCB+1        REQUESTED BUFFER ADDRESS                    $03 05664
015444 054003 A     5996         STA     SOLO+3         OVERLAY BUFFER ADDRESS OF STANDARD CALL     $03 05665
015445 002000 A     5997 SOLO    CALL    LOOUT,36,BUFR    ECHO TO LO FOR RECORD                     $03 05666
015446 015470 R
015447 000044 A
015450 000200 R
015451 017000 I     5998 SORTN   LDA     SIOUT                                                        C 03 05667
015452 006120 A     5999         ADDI    2                                                          $03 05668
015453 000002 A
015454 057000 I     6000         STA     SIOUT          ADVANCE RETURN ADDRESS                      $03 05669
015455 014007 A     6001         LDA     SIOUA                                                      $03 05670
015456 024007 A     6002         LDB     SIOUB                                                      $03 05671
015457 034007 A     6003         LDX     SIOUX                                                      $03 05672
015460 001000 A     6004         RETU*   SIOUT          RETURN                                      $03 05673
015461 115406 R
015462 000000 A     6005 OUDCB   DATA    0,0,0          DATA CONTROL BLOCK (DCB)                    $03 05674
015463 000000 A
015464 000000 A
015465 000000 A     6006 SIOUA   DATA    0              A REG                                       $03 05675
015466 000000 A     6007 SIOUB   DATA    0              B REG                                       $03 05676
015467 000000 A     6008 SIOUX   DATA    0              X REG                                       $03 05677
                    6009         EJEC                                                             $03 05678
                    6010 *                                                                        $03 05679
                    6011 *       THIS IS A SUBROUTINE TO WRITE A RECORD TO THE LO DEVICE           $03 05680
                    6012 *                                                                        $03 05681
                    6013 *       CALLING SEQUENCE                                                 $03 05682
                    6014 *       CALL    LOOUT,A,B                                                $03 05683
                    6015 *               WHERE:                                                   $03 05684
                    6016 *               A=NUMBER OF WORDS                                        $03 05685
                    6017 *               B=BUFFER ADDRESS                                         $03 05686
                    6018 *                                                                        $03 05687
                    6019 *       RETURN: A,B,X REGISTERS RESTORED                                 $03 05688
                    6020 *                                                                        $03 05689
015470 000000 A     6021 LOOUT   ENTR                                                             $03 05690
015471 054112 A     6022         STA     LDA                                                      $03 05691
015472 064112 A     6023         STB     LDB                                                      $03 05692
015473 074112 A     6024         STX     LDX                                                      $03 05693
015474 037000 I     6025         LDX     LOOUT          ADDRESS OF PARAMS                         $03 05694
015475 015000 A     6026         LDA     0,1            NUMBER OF WORDS                           $03 05695
015476 054101 A     6027         STA     LODCB          STORE IN DCB                              $03 05696
015477 015001 A     6028         LDA     1,1            BUFFER ADDRESS                            $03 05697
015500 054100 A     6029         STA     LODCB+1        STORE IN DCB                              $03 05698
015501 006027 A     6030         LDBE    SYST           SYSTEM FLAG                               $03 05699
015502 001401 R
015503 016000 A     6031         LDA     0,2                                                      $03 05700
015504 001004 A     6032         JAN     LO1            JUMP IF MOS                               $03 05701
015505 015522 R
015506 014074 A     6033         LDA     LOFLG                                                    $03 05702
015507 001002 A     6034         JAP     LO1            JUMP IF NON-RMD                           $03 05703
015510 015522 R
015511 014066 A     6035         LDA     LODCB          RECORD LENGTH                             $03 05704
015512 054006 A     6036         STA     LOLNK+4                                                  $03 05705
015513 014065 A     6037         LDA     LODCB+1        BUFFER AREA                               $03 05706
015514 054003 A     6038         STA     LOLNK+3                                                  $03 05707
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                    6039 LOLNK   IOLINK  5,BUFR+1,40                                          S03 05708
015515 002000 A
015516 015336 E
015517 001405 A
015520 000201 R
015521 000050 A
                    6040 LO1     WRITE   LODCB,LO,0,1  OUTPUT BUFFER                         S03 05709
015522 002000 A
015523 015420 E
015524 100000 A
015525 010405 A
015526 015600 R
015527 000000 A
015530 000000 A
                    6041 LO5     STAT    LO1,LO6,LO6,LO6,LO5                                  E.2*********
015531 002000 A
015532 015427 E
015533 015522 R
015534 015540 R
015535 015540 R
015536 015540 R
015537 015531 R
015540              6042 LO6     BSS     0                                                    C.1 03 05711
015540 044052 A     6043         INR     LOLINE          ADVANCE LINE NUMBER                  S03 05712
015541 014051 A     6044         LDA     LOLINE                                               S03 05713
015542 006140 A     6045         SUBI    47              LINES PER PAGE                       S03 05714
015543 000057 A
015544 001004 A     6046         JAN     LO2             JUMP IF NOT AT LIMIT                 S03 05715
015545 015567 R
015546 006017 A     6047         LDAE    LODUT                                                S03 05716
015547 015470 R
015550 054036 A     6048         STA     LO3             SAVE RETURN ADDR                     S03 05717
015551 002000 A     6049         CALL    MOVW,3,LOA,LO4      SAVE A,B,X                       S03 05718
015552 014510 R
015553 000003 A
015554 015604 R
015555 015610 R
015556 002000 A     6050         CALL    TPFRM           TOP OF FORM                          S03 05719
015557 014760 R
015560 014026 A     6051         LDA     LO3                                                  S03 05720
015561 057000 I     6052         STA     LODUT           RESTORE RETRUN ADDR                  S03 05721
015562 002000 A     6053         CALL    MOVW,3,LO4,LOA      RESTORE A,B,X                    S03 05722
015563 014510 R
015564 000003 A
015565 015610 R
015566 015604 R
       015567 R     6054 LO2     EQU     *                                                    S03 05723
015567 017000 I     6055         LDA     LODUT                                                S03 05724
015570 006120 A     6056         ADDI    2                                                    S03 05725
015571 000002 A
015572 057000 I     6057         STA     LODUT           ADVANCE RETURN ADDRESS               S03 05726
015573 014010 A     6058         LDA     LOA                                                  S03 05727
015574 024010 A     6059         LDB     LOB                                                  S03 05728
015575 034010 A     6060         LDX     LOX                                                  S03 05729
015576 001000 A     6061         RETU*   LODUT           RETURN                               S03 05730
015577 115470 R
                    6062 LODCB   DCB     40,BUFR+1,0                                          S03 05731
015600 000050 A
015601 000201 R
015602 000000 A
015603 000000 A     6063 LOFLG   DATA    0               LO ON RMD FLAG, POS=NO, NEG=YES      S03 05732
015604 000000 A     6064 LOA     DATA    0               A REG                                S03 05733
015605 000000 A     6065 LOB     DATA    0               B REG                                S03 05734
015606 000000 A     6066 LOX     DATA    0               X REG                                S03 05735
015607 000000 A     6067 LO3     DATA    0               TEMP STORAGE FOR RETURN ADDR         S03 05736
015610 000000 A     6068 LO4     DATA    0,0,0           TEMP STORAGE FOR A,B,X               S03 05737
015611 000000 A
015612 000000 A
015613 000001 A     6069 LOLINE  DATA    1               LINE CONT                            S03 05738
                    6070         EJEC                                                      C  03 05739
                    6071 *                                                                 C  03 05740
                    6072 *       SUBROUTINE TO DETERMINE IF SO = LO                        C  03 05741
                    6073 *               RETURN-- A REG=0 IF LO=SO ELSE A REG NOT= 0       C  03 05742
                    6074 *                                                                 C  03 05743
015614 000000 A     6075 SOELO   ENTR                                                      C  03 05744
015615 006037 A     6076         LDXE    LUT                                               C  03 05745
015616 015634 R
015617 035000 A     6077         LDX     0,X                                               C  03 05746
015620 035000 A     6078         LDX     0,X             LUT BASE                          C  03 05747
015621 015003 A     6079         LDA     3,X             SO ASSIGNMENT                  FF    ********
015622 006150 A     6080         ANAI    0377                                              C  03 05749
015623 000377 A
015624 054004 A     6081         STA     SOLOCH+1        SAVE IT                           C  03 05750
015625 015005 A     6082         LDA     5,X             LO ASSIGNMENT                     C  03 05751
015626 006150 A     6083         ANAI    0377                                              C  03 05752
015627 000377 A
015630 006140 A     6084 SOLOCH  SUBI    0                                                 C  03 05753
015631 000000 A
015632 001000 A     6085         JMP*    SOELO                                             C  03 05754
015633 115614 R
                    6086         EXT     $LUT                                              C  03 05755
015634 000000 E     6087 LUT     DATA    $LUT            INTERFACE LOGICAL UNIT TABLE POINTER  C  03 05756
                    6088         EJEC                                                        S03 05757
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                    6089 *                                                                                  $03 05758
                    6090 *                  FETCH                                                           $03 05759
                    6091 *                                                                                  $03 05760
                    6092 ***********************************************************************************$03 05761
                    6093 *                                                                                  $03 05762
                    6094 *       THIS IS A SUBROUTINE TO FETCH A CHAR FROM THE INPUT BUFFER                 $03 05763
                    6095 *                                                                                  $03 05764
                    6096 *       CALLING SEQUENCE                                                           $03 05765
                    6097 *       JMPM    FETCH           GET FIRST CHAR                                     $03 05766
                    6098 *                 OR                                                             $03 05767
                    6099 *       JMPM    FETCHA          GET CHAR THERE AFTER                               $03 05768
                    6100 *       RETURN:                                                                    $03 05769
                    6101 *       CHAR IN A REG, B REG DESTROYED, X REG SAME                                 $03 05770
                    6102 *                                                                                  $03 05771
                    6103 ***********************************************************************************$03 05772
                    6104 *                                                                                  $03 05773
015635 000000 A.    6105 FETCH  ENTR                                                                        $03 05774
015636 017000 I     6106        LDA     FETCH                                                               $03 05775
015637 054004 A     6107        STA     FETCHA          SET UP RETURN ADDRESS                               $03 05776
015640 005002 A     6108        TZB                                                                         $03 05777
015641 064031 A     6109        STB     CHAR            ZERO CHARS FETCHED                                  $03 05778
015642 001000 A     6110        JMP     FETCHA+1                                                            $03 05779
015643 015645 R
015644 000000 A     6111 FETCHA ENTR                                                                        $03 05780
015645 014025 A     6112        LDA     CHAR            CHARACTER COUNT                                     $03 05781
015646 004341 A     6113        LSRA    1               GET WORD COUNT                                      $03 05782
015647 054024 A     6114        STA     WORD                                                                $03 05783
015650 006010 A     6115        LDAI    BUFI            GET BUFFER ADDRESS                                  $03 05784
015651 000375 R
015652 124021 A     6116        ADD     WORD            INDEX INTO BUFFER                                   $03 05785
015653 005012 A     6117        TAB                                                                         $03 05786
015654 026000 A     6118        LDB     0,2             FETCH WORD                                          $03 05787
015655 014015 A     6119        LDA     CHAR                                                                $03 05788
015656 154016 A     6120        ANA     BIT0            TEST WHICH HALF OF WORD                             $03 05789
015657 001010 A     6121        JAZ     FETCHB          LEFT                                                $03 05790
015660 015666 R
015661 005021 A     6122        TBA                     RIGHT                                               $03 05791
015662 154013 A     6123        ANA     RHLF            MASK OFF                                            $03 05792
015663 044007 A     6124        INR     CHAR            NEXT CHAR                                           $03 05793
015664 001000 A     6125        JMP*    FETCHA          RETURN                                              $03 05794
015665 115644 R
015666 005021 A     6126 FETCHB TBA                                                                         $03 05795
015667 004350 A     6127        LSRA    8               SHIFT DOWN                                          $03 05796
015670 044002 A     6128        INR     CHAR            NEXT HCAR                                           $03 05797
015671 001000 A     6129        JMP*    FETCHA          RETURN                                              $03 05798
015672 115644 R
015673 000000 A     6130 CHAR   DATA    0                                                                   $03 05799
015674 000000 A     6131 WORD   DATA    0                                                                   $03 05800
015675 000001 A     6132 BIT0   DATA    01                                                                  $03 05801
015676 000377 A     6133 RHLF   DATA    0377                                                                $03 05802
       000201 R     6134        END     SMLTR                                                               $03 05803
ENTRY NAMES
000177 R EMEM   000716 R EXC    000000 R MMEM   000201 R SMLTR
EXTERNAL NAMES
015113 E $DATE  001214 E $DBUF  003324 E $DRM1  001221 E $DRM1B
001222 E $DRM1C 001223 E $DRM1D 001006 E $DRM2  001377 E $ELOC
015114 E $JOB   015634 E $LUT   001401 E $SYST  011566 E BIFCB
012477 E EXIT   015516 E INLINK 015523 E INTR   015532 E INTRST
012473 E LOFCB  000333 E PIFCB  000332 E SIFCB  001400 E V$LLUP
SYMBOLS
015113 E $DATE  001214 E $DBUF  003324 E $DRM1  001221 E $DRM1B
001222 E $DRM1C 001223 E $DRM1D 001006 E $DRM2  001377 E $ELOC
015114 E $JOB   015634 E $LUT   001401 E $SYST  012726 R ABDCS
010460 R ABEL   005223 R AR10   005257 R AR12   005301 R AR13
005267 R AR20   000010 A AZ     000002 A B      003305 R BCS
003346 R BCSA   003335 R BCSB   003343 R BCSC   011411 R BEOD
011566 R BIBLK  011570 R BIBUF  011563 R BIDCB  011566 E BIFCB
011531 R BIFLG  000311 R BIOPN  000304 R BIRMD  015675 R BIT0
011571 R BIT11  011572 R BIT12  011573 R BIT15  015130 R BNASC
000375 R BUFI   011574 R BUFPTR 000200 R BUFR   000020 A BZ
000036 A CARRY  013215 R CD05   013242 R CD10   013246 R CD20
013262 R CD22   013355 R CD2A   013356 R CD2B   013357 R CD2C
013266 R CD30   013270 R CD40   013275 R CD42   013304 R CD44
013324 R CD46   013335 R CD50   013202 R CDAB   013337 R CDAX
015673 R CHAR   012502 R CHME   012523 R CHMR   012517 R CHMS
011575 R CKSM   011606 R CKSU   011542 R CKSU1  011547 R CKSU2
011534 R CKSUM  010615 R CME1   010635 R CME2   010662 R CME3
010663 R CME4   010607 R CMEM   003076 R CNOT   011441 R CODE
000661 R COMM   000700 R COMM1  012732 R CONV   012760 R CONV1
012762 R CONV2  012765 R CONV3  000503 R CPAG   002144 R CR10
002147 R CR15   002165 R CR17   002203 R CR19   002223 R CR21
002227 R CR23   002231 R CR30   002241 R CR32   002317 R CR33
002324 R CR34   002362 R CR35   002404 R CR50   002420 R CR52
002422 R CR54   002440 R CR55   002465 R CR56   002475 R CR57
002457 R CR58   002514 R CR60   002536 R CR6A   002545 R CR6B
002562 R CR6C   002570 R CR6D   002576 R CR6E   002604 R CR6F
002612 R CR6G   002620 R CR6H   002626 R CR6I   002533 R CR6J
002554 R CR6K   002642 R CR6L   003047 R CR6S   003026 R CR6T
003003 R CR6U   002760 R CR6V   002735 R CR6W   002714 R CR6X
002673 R CR6Y   002650 R CR6Z   003106 R CR70   003077 R CR70A
003160 R CR71   003164 R CR72   003151 R CR73   003171 R CR74
003202 R CR76   003207 R CR77   003420 R CR7A   003421 R CR7B
003422 R CR7C   003423 R CR7D   003424 R CR7E   003216 R CR80
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003233 R CR84    003253 R CR86    003302 R CR87    001767 R CRA0
002007 R CRA2    002033 R CRA2A   002025 R CRA2B   002057 R CRA2C
002044 R CRA3    002064 R CRA4    002073 R CRA5    002142 R CRA6
002126 R CRA7    002104 R CRA8    003426 R CRAD    001673 R CRAS
001760 R CRAS1   002363 R CRAX    003430 R CRAZ    003425 R CRBA
003427 R CRBD    003073 R CRM1    003074 R CRM2    002401 R CRP
002373 R CRPE    003060 R CRS1    003064 R CRS2    003037 R CRT1
003043 R CRT2    003070 R CRTS    003014 R CRU1    003022 R CRU2
002771 R CRV1    002777 R CRV2    002746 R CRW1    002754 R CRW2
002725 R CRX1    002731 R CRX2    003347 R CRXA    003377 R CRXZ
002704 R CRY1    002710 R CRY2    002663 R CRZ1    002667 R CRZ2
001440 R D2048   015113 R DATE    000371 R DBUF    001220 R DCTBL
006072 R DLM1    006067 R DLM2    006066 R DLM3    006102 R DLM4
006107 R DLM7    006057 R DLMS    006644 R DD01    006654 R DD02
006657 R DD20    006677 R DD22    006724 R DD24    006745 R DD26
006756 R DD44    006777 R DD46    007025 R DD48    007051 R DD50
006624 R DDRG    007057 R DDT1    007060 R DDT2    000372 R DRM1
000373 R DRM2    000546 R DROM    000064 A DS      010225 R E100
010327 R E102    010600 R E104    010601 R E105    010602 R E106
010603 R E107    010604 R E108    010605 R E109    011643 R E110
011653 R E112    011721 R E113    011722 R E114    011731 R E114A
011737 R E115    011753 R E116    011754 R E117    011755 R E118
011756 R E119    011757 R E120    012015 R E121    012016 R E122
012006 R E123    011766 R E124    012017 R E130    012036 R E131
012057 R E132    012052 R E133    012061 R E140    012100 R E142
012105 R E143    012204 R E144    012206 R E145    012215 R E150
012241 R E152    012254 R E153    012364 R E154    012136 R E155
012366 R E156    012367 R E157    012370 R E158    012371 R E159
012372 R E15A    012373 R E15B    012247 R E15C    012326 R E15D
012346 R E15E    012425 R E160    012433 R E162    012451 R E170
012463 R E171    012476 R E172    010513 R EA3     010517 R EAAU
010402 R EAC1    010462 R EAC2    010365 R EACH    010606 R EADA
010352 R EADS    010357 R EADS1   010326 R EAF0    010336 R EAF1
010313 R EAFR    010535 R EAIR    010300 R EAJR    010344 R EAJS
010544 R EAKR    010553 R EAML    010562 R EAOR    010304 R EAPR
010526 R EASC    010571 R EASR    012565 R ED10    012570 R ED11
012601 R ED20    012604 R ED21    012615 R ED30    012630 R ED40
012727 R ED41    012730 R ED42    012731 R ED43    012644 R ED50
012657 R ED51    012724 R EDA     012713 R EDAB    012547 R EDR2
012530 R EDRM    001377 R ELOC    000177 R EMEM    012214 R END
012132 R ENDTRC  011403 R EOF     011611 R EOFE    011375 R ERR
001117 R EX10E   000716 R EXC     000745 R EXC0    000754 R EXC1
001111 R EXC10   001126 R EXC12   001140 R EXC14   001143 R EXC16
001144 R EXC17   001145 R EXC18   001146 R EXC19   001023 R EXC1A
001060 R EXC2    001076 R EXC3    001155 R EXC4    001101 R EXC5
001147 R EXC90   001160 R EXC92   001047 R EXCS    012477 R EXIT
012125 R EXLIM   000335 R FCBBI   000324 R FCBLD   000333 R FCBPI
000332 R FCBSI   013174 R FD09    013200 R FD10    013201 R FD11
013143 R FD15    013166 R FD16    013171 R FD17    012766 R FELD
015635 R FETCH   015644 R FETCHA  015666 R FETCHB  000045 A FIL1
000046 A FIL2    013625 R FLD05   013635 R FLD10   013650 R FLD20
013666 R FLD25   013673 R FLD30   013730 R FLD35   013743 R FLD39
013752 R FLD40   013770 R FLD50   013764 R FLD50A  013771 R FLD50B
014002 R FLD51   014011 R FLD56   014015 R FLD57   014031 R FLD60
014037 R FLD65   014023 R FLD90   014024 R FLD91   014025 R FLD92
014026 R FLD93   014027 R FLD94   014030 R FLD95   013623 R FLDCG
014045 R FLER1   014050 R FLER2   014022 R FLLRL   014167 R FLMSK
014053 R FLNAM   011576 R FREC    015136 R GET     015144 R GET2
015051 R HDR     011614 R HOPE    000505 R IMD     013364 R INA
013410 R INA3    013360 R INA5    013447 R INA8    013451 R INAA
013452 R INAN    013453 R INAV    015313 R INDCB   013611 R INER
013464 R INH     013536 R INH2    013513 R INH3    013516 R INH4
013454 R INH5    013573 R INH6    013601 R INH7    013603 R INH8
013614 R INHP    013615 R INHC    013610 R INHN    013617 R INHT
015516 E INLINK  000067 A INPF    000062 A INTA    000061 A INTF
015523 E INTR    015532 E INTRST  000040 A IOD     000050 A IOKR
000066 A IORF    000051 A IRG1    000052 A IRG2    015114 R JOB
010351 R JRFL    000502 R JSPT    000047 A KREG    011577 R LCCS
011617 R LCDE    011367 R LCOM    011274 R LDADD   011600 R LDADR
011065 R LDBP    011425 R LDCDE   011622 R LDCM    010723 R LDCS
011466 R LDCTL   010706 R LDDS    010732 R LDDSA   010737 R LDDSB
011054 R LDFR    011323 R LDIGN   011232 R LDLDR   011170 R LDMEM
011271 R LDMEX   010746 R LDMM    011260 R LDMOR   011254 R LDMV
011330 R LDNR    011327 R LDOR1   011156 R LDORG   011601 R LDPT
011230 R LDPTR   010744 R LDRC    010664 R LDRM    011360 R LDRNR
011363 R LDRNS   011320 R LDSCD   011433 R LDSIZ   011313 R LDSRV
011127 R LDSW    011071 R LDWD    014175 R LIST    014211 R LIST1
014262 R LIST3   014266 R LIST4   014007 R LIST5   014332 R LIST6
014333 R LIST7   014334 R LIST8   014335 R LIST9   014336 R LISTA
014371 R LISTB   014422 R LISTC   001400 R LLUP    010763 R LMOS
000005 A LO      015522 R LO1     015567 R LO2     015607 R LO3
015610 R LO4     015531 R LO5     015540 R LO6     015604 R LOA
015605 R LOB     015600 R LODCB   012473 R LOFCB   015603 R LOFLG
015613 R LOLINE  015515 R LOLNK   000266 R LOOPN   015470 R LOOUT
000261 R LORMD   015606 R LOX     010774 R LR1     010765 R LRCAD
011003 R LREAD1  011602 R LREC    000070 A LREG    011603 R LSB13
011640 R LSIC    003777 R LTA1    004022 R LTA2    004124 R LTA3
004126 R LTA4    004166 R LTA5    003756 R LTAA    004322 R LTAP
004250 R LTAS    004276 R LTAT    004201 R LTAW    004205 R LTAX
004206 R LTAY    004207 R LTAZ    000032 A LTCHA   000033 A LTCHB
004074 R LTMX    015634 R LUT     000053 A MADS    000031 A MASK
000060 A MBYC    000050 A MCCC    012527 R MEDIA   007643 R MFAIL
000056 A MIL     010165 R MLIP    010223 R MLIR    010215 R MLIS
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010207 R MLIT    010206 R MLIU    010202 R MLIV    010176 R MLIW
010172 R MLIX    010166 R MLIY    000000 R MMEM    007175 R MOO3
007206 R MOO4    007212 R MO10    007217 R MO11    007236 R MO12
007250 R MO14    007255 R MO16    007262 R MO18    007267 R MO20
007316 R MO22    007325 R MO24    007334 R MO26    007337 R MO30
007346 R MO32    007353 R MO34    007401 R MO36    007404 R MO38
007410 R MO40    007427 R MO41    007435 R MO45    007443 R MO50
007472 R MO51    007475 R MO52    007500 R MO53    007525 R MO54
007532 R MO56    007536 R MO58    007552 R MO59    007556 R MO60
007576 R MO61    007605 R MO62    007617 R MO6A    007620 R MO6B
007621 R MO6C    010045 R MO70    010036 R MO72    007765 R MOO1
007762 R MOO2    010033 R MOO3    010014 R MOO4    007754 R MOOR
007657 R MOP1    007172 R MOPA    007646 R MOPB    000054 A MOPC
014437 R MOV1    014447 R MOV2    014471 R MOV3    014513 R MOVC
014504 R MOVE    014462 R MOVR    014510 R MOVW    010224 R MPLE
007703 R MRE1    007700 R MRE2    007733 R MRE3    007741 R MRE4
007663 R MREQ    007744 R MREZ    001110 R MTYP    000071 A MULS
011141 R NMIC    001224 R NRM     000057 A NROM    000072 A NSTP
014514 R OH      014541 R OH2     014560 R OHA     000044 A OREG
015462 R OUDCB   000037 A OVRFL   001402 R PA1     001412 R PA2
001421 R PA3     001430 R PA4     001432 R PA5     001436 R PA8
001437 R PA9     001262 R PAG     001320 R PAG1    001333 R PAG2
001341 R PAG3    001347 R PAG4    001350 R PAG5    001357 R PAG6
001213 R PAGE    001374 R PAV1    001362 R PAVL    014575 R PBUF
015112 R PGND    001227 R PGOK    000004 A PI      015357 R PI1
015377 R PIDCB   000333 E PIFCB   015402 R PIFLG   015322 R PIIN
015342 R PIIN1   015350 R PIIN2   015403 R PIINA   015404 R PIINB
015405 R PIINX   000243 R PIOPN   000236 R PIRMD   007635 R PM1
007622 R PMEM    000504 R PPAG    000042 A PREG    001163 R PSEL
001177 R PSELB   001214 R PSTBL   015206 R PUT     015170 R PUTLP
000063 A QS      000526 R R0      000527 R R1      000530 R R2
000531 R R3      000532 R R4      000533 R R5      000534 R R6
000535 R R7      000536 R R8      000537 R R9      000540 R RA
000541 R RB      000542 R RC      011604 R RCN     012060 R RCNT
000543 R RD      011632 R RDER    000544 R RE      014613 R REG1
014616 R REG2    014652 R REG3    014661 R REG6    014662 R REG7
014663 R REG8    014606 R REGS    000545 R RF      015676 R RHLF
000441 R RHLT    000445 R RHLT0   000452 R RHLT1   000457 R RHLT2
000464 R RHLT3   011467 R RMD     011503 R RMD1    011530 R RMDT
001441 R S100    001455 R S101    001457 R S102    001467 R S103
001471 R S104    001501 R S105    001507 R S106    001534 R S106A
001542 R S106B   001475 R S108    001616 R S111    001560 R S120
001572 R S120A   001601 R S120B   001614 R S121    001610 R S123
001623 R S200    001655 R S201    001633 R S205    001660 R S210
001661 R S211    001667 R S219    003431 R S300    003433 R S302
003450 R S304    003511 R S305    003657 R S316    003660 R S317
003661 R S318    003730 R S319    003731 R S31A    003743 R S31B
003744 R S31D    003751 R S31E    003673 R S320    003711 R S322
004374 R SAL2    004352 R SALU    014702 R SAR     014664 R SAR1
014670 R SAR2    014677 R SAR3    011446 R SCOD    011635 R SEQE
011417 R SEQER   010442 R SETM1   010453 R SETM3   010434 R SETMUX
000002 A SI      015267 R SI1     015276 R SI2     000332 E SIFCB
015316 R SIFLG   015220 R SIIN    015260 R SIIN1   015235 R SIIN2
015252 R SIIN3   015317 R SIINA   015320 R SIINB   015321 R SIINX
015302 R SILO    015417 R SIOU1   015465 R SIOUA   015466 R SIOUB
015406 R SIOUT   015467 R SIOUX   000227 R SIRMD   015306 R SIRTN
000220 R SMBI    000213 R SMLO    000201 R SMLTR   000206 R SMPI
000003 A SO      015426 R SO1     015435 R SO2     015614 R SOELO
015445 R SOLO    015630 R SOLOCH  015451 R SORTN   014747 R SPAC
000043 A SREG    000506 R STACK   012213 R START   000471 R STEP
012126 R STRTRC  000041 A STUS    000065 A SUPK    001401 R SYST
015205 R TABL    003073 R TMOT    000641 R TMUX    014760 R TPFRM
015102 R TPMOS   015115 R TPST    015106 R TPVOR   014732 R TRA
000472 R TRACE   014720 R TRC     014705 R TRD     014741 R TRE
014744 R TRSET   014715 R TRSETA  000476 R V       011527 R V$DSTB
001400 E V$LLUP  011526 R V$LUT1  000001 A VORTEX  011605 R WDCT
015674 R WORD    000001 A X       004402 R X000    004616 R X002
005047 R X004    005052 R X008    005053 R X009    005054 R X00A
005055 R X00C    005056 R X00D    005057 R X010    005103 R X012
005145 R X013    005152 R X014    005155 R X015    005162 R X019
005163 R X020    005307 R X021    005310 R X022    005331 R X023
005337 R X024    005340 R X025    005254 R X026    005361 R X030
005365 R X032    005371 R X034    005376 R X036    005401 R X038
005405 R X040    005410 R X042    005414 R X044    005421 R X046
005426 R X048    005432 R X050    005435 R X052    005440 R X054
005443 R X056    005450 R X058    005453 R X060    005456 R X062
005457 R X063    005472 R X064    005476 R X066    005503 R X068
005506 R X070    005520 R X071    005530 R X072    005545 R X074
005575 R X075    005603 R X076    005617 R X078    005631 R X080
005643 R X082    005660 R X084    005701 R X086    005713 R X088
005717 R X089    005724 R X090    005733 R X092    005752 R X094
005762 R X095    005762 R X096    005771 R X097    006025 R X099
005777 R X09A    006012 R X09B    006016 R X09C    006026 R X0A0
006045 R X0A1    006055 R X0AA    006056 R X0AB    006112 R X100
006366 R X101    006406 R X102    006455 R X103    006506 R X104
006523 R X105    006533 R X106    006504 R X107    006474 R X108
006461 R X109    006450 R X120    006615 R X130    006606 R X134
006611 R X136    007061 R X200    007101 R X202    007142 R X204
007147 R X205    007152 R X206    007136 R X207    007163 R X208
000030 A XA      004637 R XA10    004603 R XA12    004661 R XA14
004665 R XA20    004676 R XA22    004712 R XA24    004720 R XA26
004422 R XA30    004430 R XA32    004522 R XA40    004536 R XA41
004552 R XA42    004561 R XA44    004567 R XA46    004573 R XA48
```

```
004500 R XA49    004606 R XA50    004612 R XA52    004726 R XA80
004741 R XA82    004750 R XA84    004757 R XA86    004767 R XA88
005004 R XA90    005021 R XA92    005031 R XA94    005037 R XA96
000011 A XAB     000001 A XAF     005205 R XAL1    000034 A XALU
000027 A XB      000020 A XC      000035 A XCIN    000016 A XF
000004 A XFS     000007 A XG      000012 A XIMC    003506 R XIRG2
000014 A XLA     000013 A XLB     000010 A XM      000017 A XMD
000002 A XMS     000003 A XMT     005766 R XO96A   000022 A XOS
000015 A XR      000006 A XS      006135 R XS10    006140 R XS15
006170 R XS20    006213 R XS21    006214 R XS23    006210 R XS24
006225 R XS30    006231 R XS32    004460 R XS33    004472 R XS34
004475 R XS36    007510 R XS41    006232 R XS45    006242 R XS46
006244 R XS50    006251 R XS60    006260 R XS61    006305 R XS64
006327 R XS64A   006345 R XS65    006360 R XS70    006365 R XS71
006400 R XS73    006405 R XS74    006422 R XS76    006427 R XS78
006430 R XS80    006442 R XS81    006447 R XS82    006543 R XS90
006577 R XS91    006602 R XS92    000005 A XT      000026 A XTC
000000 A XTS     000023 A XV      000021 A XW      000025 A XX
000024 A XY      000040 A XZ      015217 R ZEROB
  0 ERRORS ASSEMBLY COMPLETE
```

```
  0   $DBUF     126   127   428   520
  0   $DRM1     132   135   430   525
  0   $DRM1B    134   526
  0   $DRM1C    134   527
  0   $DRM1D    134   528
  0   $DRM2     133   136   432
  0   $ELOC     626   628
  0   $SYST     630   631
  0   BIBLK     101
  0   BIFCB      66    97   108
  0   BIFLG     103
 97   BIOPN      96
 93   BIRMD      61
 50   BUFR      109
  0   CHME      377
  0   CMEM      371
353   COMM      452   489
369   COMM1     490
165   CPAG      516   544   663   681   708
926   CR17      917
937   CR19      931
951   CR21      929
954   CR23      927
958   CR30      923   935   949   952
1010  CR33      974   977   978   981   982   985   986   989   990
                993   994   996  1008
1015  CR34      807  1000
1037  CR35     1020  1026
  0   CR50      788   880
  0   CR70A     860   863
821   CRA0      798   819
838   CRA2      825   828
850   CRA2A     841
846   CRA2B     854
861   CRA2C     852
855   CRA3      847
869   CRA4      791
877   CRA5      794
903   CRA6      849   857   885   887   893   897   900  1048
895   CRA7      881   889   891
883   CRA8      845   878
  0   CRAD      958   962   963
784   CRAS      672   833   859   971  1009  1036
817   CRAS1     804
1044  CRAX      809   816   820   844   872
  0   CRBA      908   966
  0   CRBD      903   967
  0   CRM1      922
1053  CRP      1051
1051  CRPE     1025  1046
  0   CRTS      919   921   933   941   942   946   947
  0   CRXA      673
652   D2048     424   426   634   638   642
127   DBUF      429   552
525   DCTRL     553
135   DRM1      431   557
136   DRM2      433   559
192   DROM      667   674   677   706   785
313   DS        939
  0   E100      369
  0   E120      374
  0   E130      380
  0   E140      381
  0   E150      372
  0   E170      379
  0   EDRM      373
628   ELOC      419   615
 49   EMEM       47
  0   ENDTRC    401
388   EXC        62   104   375   386
405   EXC0      409
```

410	EXC1	405								
468	EXC10	456	496	512	518	690	691	700	723	1052
476	EXC12	482								
484	EXC14	479								
487	EXC16	485								
489	EXC17	473								
490	EXC18	474								
491	EXC19	472	478							
439	EXC1A	445	447							
458	EXC2	437								
459	EXC3	402	410	416						
498	EXC4	468								
462	EXC5	439								
495	EXC90	471	477	508						
499	EXC92	495								
449	EXCS	382								
0	EXIT	113								
0	EXLIM	661								
108	FCBBI	93	98							
107	FCBLD	83	88							
106	FCBPI	73	78							
105	FCBSI	68								
0	FELD	670								
0	FETCH	441	470	574						
0	FETCHA	507	582							
167	IMD	800	815	822	970	1007	1035			
0	INA	665								
0	INLINK	31	32							
321	INPF	846								
316	INTA	829								
315	INTF	827								
0	INTR	18	19							
0	INTRST	26	27							
306	IRG2	920	943							
164	JSPT	808	811	998	1002	1005	1016	1029	1031	
0	LDRM	376								
0	LIST	671								
629	LLUP	619								
0	LO1	89								
0	LOFCB	65	87	107						
0	LOFLG	91								
0	LOLINE	392								
87	LOOPN	86								
0	LOOUT	761								
83	LORMD	59								
0	LREAD	99								
0	LTMX	679								
313	MBYC	937								
0	MICSIM	16								
48	MMEM	47								
0	MOPA	676								
309	MOPC	743								
463	MTYP	448								
530	NRM	513	595							
312	NROM	669	713	969	1028					
324	NSTP	933								
0	OH	757	760							
0	P	22	22	22	22	23	28	28	28	28
		28	34	35	35					
633	PA1	624								
638	PA2	635								
642	PA3	639								
646	PA4	643								
647	PA5	637	641	645						
650	PA8	614	648							
651	PA9	633								
571	PAG	438	588	592	594	596				
587	PAG1	583	585							
593	PAG2	577	579	586	590					
597	PAG4	545	581	587						
598	PAG5	572								
599	PAG6	593								
519	PAGE	390	515	543	549	554				
623	PAV1	618								
613	PAVL	589	649							
0	PGND	435								
542	PGOK	510	547	561	862	1023	1045			
0	PIFCB	64	77	106						
0	PIFLG	81								
0	PIIN2	79								
77	PIOPN	76								
73	PIRMD	57								
166	PPAG	517	664	682						
507	PSEL	378								
513	PSELB	511								
520	PSTBL	423	425	427	548	591				
177	R5	455								
0	RCNT	461	662	693	697					
143	RHLT	707	717							
147	RHLT0	143	459							
148	RHLT1	144								
149	RHLT2	145								
150	RHLT3	146								

```
   0   RMD        54    56    58    60
660    $100      370
670    $101      668   683
686    $106      680   694   698
699    $106A     695
701    $106B     699
725    $111      722
705    $120      692   721
712    $120A     720
718    $120B     711
722    $123      714
741    $200      764
763    $201      750
748    $205      744
766    $210      742   756
767    $211      747   759   763
768    $219      755   758   761
   0   $300      675
   0   $AR       395   399   451
   0   $IFCB      63   105
   0   $IFLG      71
   0   $IIN      440   469   573
   0   $IIN1      69
   0   $IOUT     437   439   468   495   513   572   593   595   699
                 722  1051
  68   $IRMD      55
  60   $MBI       92
  58   $MLO       82
  54   $MLTR      38
  56   $MPI       72
 168   $TACK     814  1001  1013  1015  1034
 151   $TEP      391   687
   0   $TRTRC    397
   0   TPFRM     436
 152   TRACE     460
   0   TRSETA    749
 155   V         452   453
   0   V$LLUP    627   629
   0   X100      678
 285   XA        801
 270   XAB       888   895
 262   XAF       906
 284   XB        805   935
 265   XFS       915   926
 268   XG        823   838   869
 271   XIMC      795   842   850   855   883   898
 263   XMS       961
 264   XMT       959
 279   XOS       975
 267   XS        789   877
 266   XT        786

 283   XTC       991
 261   XTS       830   861   901  1044
 280   XV        979
 278   XW        972
 282   XX        987
 281   XY        983
```

```
000001 A     1 VORTEX SET    1                                                                  03 00001
             2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE          03 00002
             3 *                                                                                03 00003
             4 *    V.D.M.  PART  NO.        92L0506-149C                                       03 00004
             5 *                                                                                03 00005
             6 *                                          RELEASE     10-15-73                  03 00006
             7 *                                                                                03 00007
             8 *               DATAN                                                            03 00008
             9 *                                                                                03 00009
            10 *                                                                                03 00010
            11        TITLE   DATAN                                                             03 00011
            12 *      ARCTANGENT OF EXTENDED PRECISION NUMBER                                   03 00012
            13 *                                                                                03 00013
            14 *      CALL    DATAN,ARG              AC=ARCTAN(ARG)                             03 00014
            15 *                                                                                03 00015
            16 *      CALL    $DAN                                                              03 00016
            17 *                                                                                03 00017
            18 *              AC=ARC TAN (AC) AC=PSEUDO ACCUMULATOR.                            03 00018
            19 *                                                                                03 00019
            20        NAME    $DAN,DATAN                                                        03 00020
            22 *********                                                                        03 00022
            23 * MACRO *                                                                       03 00023
            24 *********                                                                        03 00024
            25 FSE     MAC                                                                     03 00025
            26         IFT     VORTEX-2                                                     D.103 00026
            27         IFF     VORTEX-4                                                     D.103 00027
            28         GOTO    FRMWR1                                                       D.103 00028
            29         EXT     $SE                                                          D.103 00029
            30         CALL    $SE            XFER PARAMETERS                               D.103 00030
            31         GOTO    FRMWR2                                                       D.103 00031
            32 FRMWR1  CONT                                                                 D.103 00032
            33         DATA    0105036        BCS XFER PARAMETERS                           D.103 00033
            34 FRMWR2  CONT                                                                 D.103 00034
            35         EMAC                                                                    03 00035
            38 * DOUBLE PRECISION LOAD                                                      D.103 00038
            39 FLDD    MAC                                                                  D.103 00039
            40         IFT     VORTEX-3                                                     D.103 00040
            41         IFF     VORTEX-4                                                     D.103 00041
            42         GOTO    FRMWR1                                                       D.103 00042
            43         EXT     $DLO           DP LOAD                                       D.103 00043
            44         CALL    $DLO                                                         D.103 00044
            45         GOTO    FRMWR2                                                       D.103 00045
            46 FRMWR1  CONT                                                                 D.103 00046
            47         DATA    0105522        FPP DP LOAD                                   D.103 00047
            48 FRMWR2  CONT                                                                 D.103 00048
            49         EMAC                                                                 D.103 00049
            50         EXT     AC             DP ACCUMULATOR                                D.103 00050
            53 * DOUBLE PRECISION STORE                                                     D.103 00053
            54 FSTD    MAC                                                                  D.103 00054
            55         IFT     VORTEX-3                                                     D.103 00055
            56         IFF     VORTEX-4                                                     D.103 00056
            57         GOTO    FRMWR1                                                       D.103 00057
            58         EXT     $STO                                                         D.103 00058
            59         CALL    $STO           DP STORE                                      D.103 00059
            60         GOTO    FRMWR2                                                       D.103 00060
            61 FRMWR1  CONT                                                                 D.103 00061
            62         DATA    0105710        FPP DP STORE                                  D.103 00062
            63 FRMWR2  CONT                                                                 D.103 00063
            64         EMAC                                                                 D.103 00064
            67 * DOUBLE PRECISION ADD                                                       D.103 00067
            68 FADD    MAC                                                                  D.103 00068
            69         IFT     VORTEX-3                                                     D.103 00069
            70         IFF     VORTEX-4                                                     D.103 00070
            71         GOTO    FRMWR1                                                       D.103 00071
            72         EXT     $ZK                                                          D.103 00072
            73         CALL    $ZK            DP ADD                                        D.103 00073
            74         GOTO    FRMWR2                                                       D.103 00074
            75 FRMWR1  CONT                                                                 D.103 00075
            76         DATA    0105503        FPP DP ADD                                    D.103 00076
            77 FRMWR2  CONT                                                                 D.103 00077
            78         EMAC                                                                 D.103 00078
            81 * DOUBLE PRECISION SUBTRACT                                                  D.103 00081
            82 FSBD    MAC                                                                  D.103 00082
            83         IFT     VORTEX-3                                                     D.103 00083
            84         IFF     VORTEX-4                                                     D.103 00084
            85         GOTO    FRMWR1                                                       D.103 00085
            86         EXT     $ZL                                                          D.103 00086
            87         CALL    $ZL            DP SUBTRACT                                   D.103 00087
            88         GOTO    FRMWR2                                                       D.103 00088
            89 FRMWR1  CONT                                                                 D.103 00089
            90         DATA    0105543        FPP DP SUBTRACT                               D.103 00090
            91 FRMWR2  CONT                                                                 D.103 00091
            92         EMAC                                                                 D.103 00092
            94 * DOUBLE PRECISION MULTIPLY                                                  D.103 00094
            95 FMUD    MAC                                                                  D.103 00095
            96         IFT     VORTEX-3                                                     D.103 00096
            97         IFF     VORTEX-4                                                     D.103 00097
            98         GOTO    FRMWR1                                                       D.103 00098
            99         EXT     $ZM                                                          D.103 00099
           100         CALL    $ZM            DP MULTIPLY                                   D.103 00100
           101         GOTO    FRMWR2                                                       D.103 00101
           102 FRMWR1  CONT                                                                 D.103 00102
           103         DATA    0105506                                                      D.103 00103
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                        104 FRMWR2  CONT                                                    D.103 00104
                        105         EMAC                                                    D.103 00105
                        108 * DOUBLE PRECISION DIVIDE                                       D.103 00108
                        109 FDVD    MAC                                                     D.103 00109
                        110         IFT     VORTEX-3                                        D.103 00110
                        111         IFF     VORTEX-4                                        D.103 00111
                        112         GOTO    FRMWR1                                          D.103 00112
                        113         EXT     $ZN                                             D.103 00113
                        114         CALL    $ZN             DP DIVIDE                       D.103 00114
                        115         GOTO    FRMWR2                                          D.103 00115
                        116 FRMWR1  CONT                                                    D.103 00116
                        117         DATA    0105535         FPP DP DIVIDE                   D.103 00117
                        118 FRMWR2  CONT                                                    D.103 00118
                        119         EMAC                                                    D.103 00119
                        121         EXT     POLY,IF                                         V&103 00121
000020              A   122 NBIT    EQU     16                                                  03 00122
                        123 *                                                                   03 00123
000000 000000       A   124 DATAN   ENTR                                                        03 00124
                        125         FSE             XFER PARAMETERS                             03 00125
000001 002000       A
000002 000000       E
000003 000001       A   126         DATA    1                                                   03 00126
000004 000000       A   127 DARG    DATA    0                                                   03 00127
000005 006010       A   128         LDAI    DATAN+0100000                                       03 00128
000006 100000       R
000007 054005       A   129         STA     $DAT                                                03 00129
                        130         FLDD                                                V&103 00130
000010 002000       A
000011 000000       E
000012 100004       R   131         DATA    (DARG)*                                             03 00131
000013 001000       A   132         JMP     DAT01                                       V&103 00132
000014 000016       R
000015                  133 $DAN    BSS     0                                                   03 00133
000015                  134 $DAT    BSS     1               ENTRY                               03 00134
                        135         IFT     VORTEX-1                                    D.103 00135
                        136         IFF     VORTEX-2                                    D.103 00136
                        137         GOTO    FRMWR1                                      D.103 00137
                        138         FLDD                                                V&103 00138
                        139         DATA    AC                                          V&103 00139
                        140 FRMWR1  CONT                                                V&103 00140
                        141 DAT01   FSTD                                                V&103 00141
000016 002000       A
000017 000000       E
                        142         IFT     VORTEX-3                                    E.1********
                        143         IFF     VORTEX-4                                    E.1********
                        144         GOTO    DAFPP                                       E.1********
000020 000211       R   145         DATA    DAT0                                        V&103 00142
                        146         IFT     VORTEX-1                                    V&103 00143
                        147         IFF     VORTEX-2                                    V&103 00144
                        148         GOTO    FRMWR1                                      V&103 00145
                        149         FLDD                                                V&103 00146
                        150         DATA    DAT0                                        V&103 00147
                        151 FRMWR1  CONT                                                V&103 00148
                        152         FSBD            1.0                                 V&103 00149
000021 002000       A
000022 000000       E
000023 000165       R   153         DATA    DAN1                                        V&103 00150
                        154         FSTD                                                V&103 00151
000024 002000       A
000025 000017       E
000026 000215       R   155         DATA    DATP                                        V&103 00152
                        156         FLDD            0.0                                 V&103 00153
000027 002000       A
000030 000011       E
000031 000171       R   157         DATA    DATZ                                        V&103 00154
                        158         FSTD                                                V&103 00155
000032 002000       A
000033 000025       E
000034 000221       R   159         DATA    DATS                                        V&103 00156
000035 002000       A   160         CALL    IF,DATP,DAT3,DAT3,DAT1X                         ********
000036 000000       E
000037 000215       R
000040 000146       R
000041 000146       R
000042 000050       R
                        161 DAT3X   FLDD                                                    ********
000043 002000       A
000044 000030       E
000045 000205       R   162         DATA    DAP2M                                           ********
000046 001000       A   163         JMP     DAT2X                                           ********
000047 000053       R
                        164 DAT1X   FLDD                                                    ********
000050 002000       A
000051 000044       E
000052 000201       R   165         DATA    DAP2                                            ********
                        166 DAT2X   FSTD                                                    ********
000053 002000       A
000054 000033       E
000055 000221       R   167         DATA    DATS                                            ********
000056                  168 DAT1    BSS     0                                                   03 00158
                        169         FLDD            -1.0                                V&103 00159
000056 002000       A
000057 000051       E
```

```
000060 000175 R   170          DATA    DATM                                  V&103 00160
                  171          FDVD                                          V&103 00161
000061 002000 A
000062 000000 E
000063 000211 R   172          DATA    DATQ                                  V&103 00162
                  173          FSTD                                          V&103 00163
000064 002000 A
000065 000054 E
000066 000211 R   174          DATA    DATQ                                  V&103 00164
000067            175 DAT2     BSS     0                                        03 00169
                  176          FLDD                                          V&103 00170
000067 002000 A
000070 000057 E
000071 000211 R   177          DATA    DATQ                                  V&103 00171
000072 054136 A   178          STA     DATX                                     03 00172
000073 014116 A   179          LDA     DATQ+1                                   03 00173
000074 001002 A.  180          JAP     DAT5                                     03 00174
000075 000101 R
                  181          FMUD                                          V&103 00175
000076 002000 A
000077 000000 E
000100 000175 R   182          DATA    DATM                                  V&103 00176
000101            183 DAT5     BSS     0                                        03 00177
000101 014127 A   184          LDA     DATX                                     03 00178
                  185          FSBD                                          V&103 00179
000102 002000 A
000103 000022 E
000104 000225 R   186          DATA    DATE                                  V&103 00180
                  187          IFT     VORTEX-1                              V&103 00181
                  188          IFF     VORTEX-2                              V&103 00182
                  189          GOTO    FRMWR1                                V&103 00183
                  190          FSTD                                          V&103 00184
                  191          DATA    AC                                    V&103 00185
                  192 FRMWR1   CONT                                          V&103 00186
000105 002000 A   193          CALL    IF,AC,DAT4,DAT4,DAT7                     03 00187
000106 000036 E
000107 000000 E
000110 000113 R
000111 000113 R
000112 000120 R
000113            194 DAT4     BSS     0                                        03 00188
                  195          FLDD                                          V&103 00189
000113 002000 A
000114 000070 E
000115 000211 R   196          DATA    DATQ                                  V&103 00190
000116 001000 A   197          JMP     DAT6                                     03 00191
000117 000141 R
000120            198 DAT7     BSS     0                                        03 00192
                  199          FLDD                                          V&103 00193
000120 002000 A
000121 000114 E
000122 000211 R   200          DATA    DATQ                                  V&103 00194
                  201          FMUD                                          V&103 00195
000123 002000 A
000124 000077 E
000125 000211 R   202          DATA    DATQ                                  V&103 00196
                  203          FSTD                                          V&103 00197
000126 002000 A
000127 000065 E
000130 000215 R   204          DATA    DATP                                  V&103 00198
                  205          IFT     VORTEX-1                              V&103 00199
                  206          IFF     VORTEX-2                              V&103 00200
                  207          GOTO    FRMWR1                                V&103 00201
                  208          FLDD                                          V&103 00202
                  209          DATA    DATP                                  V&103 00203
                  210          FSTD                                          V&103 00204
                  211          DATA    AC                                    V&103 00205
                  212 FRMWR1   CONT                                          V&103 00206
000131 002000 A   213          CALL    POLY,15,DAAA,DATP                        03 00207
000132 000000 E
000133 000017 A
000134 000232 R
000135 000215 R
                  214          IFT     VORTEX-1                              D.103 00208
                  215          IFF     VORTEX-2                              D.103 00209
                  216          GOTO    FRMWR1                                D.103 00210
                  217          FLDD                                          V&103 00211
                  218          DATA    AC                                    V&103 00212
                  219 FRMWR1   CONT                                          V&103 00213
                  220          FMUD                                          V&103 00214
000136 002000 A
000137 000124 E
000140 000211 R   221          DATA    DATQ                                  V&103 00215
000141            222 DAT6     BSS     0                                        03 00216
                  223          FADD                                          V&103 00217
000141 002000 A
000142 000000 E
000143 000221 R   224          DATA    DATS                                  V&103 00218
                  225          IFT     VORTEX-1                              V&103 00219
                  226          IFF     VORTEX-2                              V&103 00220
                  227          GOTO    FRMWR1                                V&103 00221
                  228          FSTD                                          V&103 00222
                  229          DATA    AC                                    V&103 00223
```

```
                        230 FRMWR1 CONT                                                                  V&103 00224
000144 001000 A         231        JMP*     $DAT          RETURN                                          03 00225
000145 100015 R
000146                  232 DAT3   BSS      0                                                             03 00226
                        233        FLDD                                                                  V&103 00227
000146 002000 A
000147 000121 E
000150 000211 R         234        DATA     DATQ                                                         V&103 00228
                        235        FADD                                                                  V&103 00229
000151 002000 A
000152 000142 E
000153 000165 R         236        DATA     DAN1                                                         V&103 00230
                        237        FSTD                                                                  V&103 00231
000154 002000 A
000155 000127 E
000156 000215 R         238        DATA     DATP                                                         V&103 00232
000157 002000 A         239        CALL     IF,DATP,DAT3X,DAT2,DAT2                                       ********
000160 000106 E
000161 000215 R
000162 000043 R
000163 000067 R
000164 000067 R
                        240 *                                                                            03 00234
                        241 *      TERMS FOR $DAT                                                        03 00235
                        242 *                                                                            03 00236
                        243        IFF      NBIT,,18                                                     03 00237
                        244 1      CONT                                                                  03 00238
000165 000201 A         245 DAN1   DATA     0201,040000,0,0 1.0                                           03 00239
000166 040000 A
000167 000000 A
000170 000000 A
000171 000200 A         246 DATZ   DATA     0200,0,0,0       0.0                                          03 00240
000172 000000 A
000173 000000 A
000174 000000 A
000175 000201 A         247 DATM   DATA     0201,0137777,0,0  -1.0                                        03 00241
000176 137777 A
000177 000000 A
000200 000000 A
000201 000201 A         248 DAP2   DATA     0201,062207,073250,042050  1.570796326794 = PI/2             03 00242
000202 062207 A
000203 073250 A
000204 042050 A
000205 000201 A         249 DAP2M  DATA     0201,0115570,073250,042050   -PI/2                            ********
000206 115570 A
000207 073250 A
000210 042050 A
                        250        GOTO     2                                                             03 00243
                        251 1      CONT                                                                  03 00244
                        252 DAN1   DATA     0201,0200000,0,0  1.0D0                                       03 00245
                        253 DATZ   DATA     0200,0,0,0         0.0                                       03 00246
                        254 DATM   DATA     0201,0577777,0,0 -1.0D0                                      03 00247
                        255 DAP2   DATA     0201,0311037,0265210,0203524  1.570796326794D0=PI/2          03 00248
                        256 2      CONT                                                                  03 00249
000211                  257 DATQ   BSS      4                                                             03 00250
000215                  258 DATP   BSS      4                                                             03 00251
000221                  259 DATS   BSS      4                                                             03 00252
                        260        IFF      NBIT,,16                                                     03 00253
000225 000122 A         261 DATE   DATA     0122,040000,0,0                                               03 00254
000226 040000 A
000227 000000 A
000230 000000 A
                        262        IFF      NBIT,,18                                                     03 00255
                        263 DATE   DATA     0122,0200000,0,0                                              03 00256
000231                  264 DATX   BSS      1                                                             03 00257
                        265 *COEFFICIENTS FOR THE RATIONAL POLYNOMIAL APPROXIMATION.                     03 00258
000232                  266 DAAA   BSS      0                                                             03 00259
                        267        IFF      NBIT,,18                                                     03 00260
                        268        GOTO     1                                                             03 00261
000232 000200 A         269        DATA     0200,0077777,077777,077731  0.9999999999988 E 0               03 00262
000233 077777 A
000234 077777 A
000235 077731 A
000236 000177 A         270        DATA     0177,0125252,025252,020122 -0.3333333331404 E 0               03 00263
000237 125252 A
000240 025252 A
000241 020122 A
000242 000176 A         271        DATA     0176,0063146,031410,042656  0.1999999900684 E 0               03 00264
000243 063146 A
000244 031410 A
000245 042656 A
000246 000176 A         272        DATA     0176,0133333,042422,022714 -0.1428569001830 E 0               03 00265
000247 133333 A
000250 042422 A
000251 022714 A
000252 000175 A         273        DATA     0175,0070706,015553,004152  0.1111076896853 E 0               03 00266
000253 070706 A
000254 015553 A
000255 004152 A
000256 000175 A         274        DATA     0175,0121360,011123,014350 -0.9087807908591 E-1               03 00267
000257 121360 A
000260 011123 A
000261 014350 A
```

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000262 000175 A  275          DATA    0175,0047222,017216,061136  0.767297314989 E-1          03 00268
000263 047222 A
000264 017216 A
000265 061136 A
000266 000175 A  276          DATA    0175,0136237,061437,036351 -0.6579885253168 E-1          03 00269
000267 136237 A
000270 061437 A
000271 036351 A
000272 000174 A  277          DATA    0174,0071211,032770,023742  0.5592617347787 E-1          03 00270
000273 071211 A
000274 032770 A
000275 023742 A
000276 000174 A  278          DATA    0174,0121522,021521,016624 -0.4525237258238 E-1          03 00271
000277 121522 A
000300 021521 A
000301 016624 A
000302 000174 A  279          DATA    0174,0041602,073161,065540  0.3296456403558 E-1          03 00272
000303 041602 A
000304 073161 A
000305 065540 A
000306 000173 A  280          DATA    0173,0126404,051573,074570 -0.2025952550899 E-1          03 00273
000307 126404 A
000310 051573 A
000311 074570 A
000312 000172 A  281          DATA    0172,0050046,052676,075670  0.9784064240615 E-2          03 00274
000313 050046 A
000314 052676 A
000315 075670 A
000316 000170 A  282          DATA    0170,0110117,015134,003673 -0.3408456556136 E-2          03 00275
000317 110117 A
000320 015134 A
000321 003673 A
000322 000166 A  283          DATA    0166,0061203,020475,016144  0.7515925073874 E-3          03 00276
000323 061203 A
000324 020475 A
000325 016144 A
000326 000163 A  284          DATA    0163,0127025,066515,041106 -0.7812251868900 E-4          03 00277
000327 127025 A
000330 066515 A
000331 041106 A
               285            GOTO    2                                                        03 00278
               286 1          CONT                                                             03 00279
               287            DATA    0200,0377777,0377777,0372561   0.9999999999988 D 0       03 00280
               288            DATA    0177,0525252,0125244,0011466  -0.3333333331404 D 0       03 00281
               289            DATA    0176,0314631,0230210,0264512   0.1999999900684 D 0       03 00282
               290            DATA    0176,0555555,0050444,0271134  -0.1428569001833 D 0       03 00283
               291            DATA    0175,0343430,0333061,0012047   0.1111076996853 D 0       03 00284
               292            DATA    0175,0505703,0222463,0034752  -0.9987807903591 D-1       03 00285
               293            DATA    0175,0235110,0364354,0113511   0.7672973149089 D-1       03 00286
               294            DATA    0175,0571174,0030767,0234641  -0.6579885253168 D-1       03 00287
               295            DATA    0174,0345045,0257604,0373710   0.5592617347787 D-1       03 00288
               296            DATA    0174,0506512,0032423,0261653  -0.4525237258230 D-1       03 00289
               297            DATA    0174,0207013,0263435,0153747   0.3296456403558 D-1       03 00290
               298            DATA    0173,0532021,0233677,0055746  -0.2025952550099 D-1       03 00291
               299            DATA    0172,0240232,0255757,0166526   0.9784064240615 D-2       03 00292
               300            DATA    0170,0440477,0322700,0366516  -0.3403456556136 D-2       03 00293
               301            DATA    0166,0305015,0011723,0214263   0.7515925073874 D-3       03 00294
               302            DATA    0163,0534124,0152330,0110146  -0.7812251868900 D-4       03 00295
               303 2          CONT                                                             03 00296
               304 DAFPP      CONT                                                                E.1********
               305            IFT     VORTEX-1                                                    E.1********
               306            IFF     VORTEX-2                                                    E.1********
               307            GOTO    DASOFT                                                      E.1********
               308            DATA    V                                                           E.1********
               309 **********************                                                         E.1********
               310 * SET FINAL CONDITIONS *                                                       E.1********
               311 **********************                                                         E.1********
               312            TZB                     INIT SIGN FLAG                              E.1********
               313            LDA     V+1                                                         E.1********
               314            JAP     DAT010                                                      E.1********
               315            IBR                     (SET NEGATIVE)                              E.1********
               316            CPA                     FORCE POSITIVE                              E.1********
               317            STA     V+1                                                         E.1********
               318 DAT010     FLDD                    COMPARE TO 1.0                              E.1********
               319            DATA    ONE                                                         E.1********
               320            FSBD                                                                E.1********
               321            DATA    V                                                           E.1********
               322            FSTD                                                                E.1********
               323            DATA    TEMP                                                        E.1********
               324            LDXI    PIOVR2          INIT CONSTANT DIFFERENCE                    E.1********
               325            LDA     TEMP+1          X .GT. 1?                                   E.1********
               326            JAP     DAT030          NO-  GO SET CONSTANTS                       E.1********
               327            FLDD                    INVERT X                                    E.1********
               328            DATA    ONE                                                         E.1********
               329            FDVD                                                                E.1********
               330            DATA    V                                                           E.1********
               331            FSTD                                                                E.1********
               332            DATA    V                                                           E.1********
               333            LDAI    ONE             INIT SIGN OF RESULT                         E.1********
               334            JBNZ    DAT020          (USE +)                                     E.1********
               335 DAT015     LDAI    MONE            (USE -)                                     E.1********
               336 DAT020     STA     DSTH21                                                      E.1********
               337            STX     DSTH18                                                      E.1********
```

```
338 ********************************************** E.1********
339 * SELECT THE APPROPRIATE TAN-1(U) (BY EIGHTHS) * E.1********
340 ********************************************** E.1********
341          LDA     V                              E.1********
342          TZB                                    E.1********
343          SUBI    0175                           E.1********
344          JAN     D8TH11                         E.1********
345          IBR                                    E.1********
346          JAZ     D8TH11                         E.1********
347          SUBI    0200-0175                      E.1********
348          LDB     V+1                            E.1********
349          ASRB    11                             E.1********
350          JAZ     D8TH09          NO SHIFT OF B  E.1********
351          JAP     D8TH01          FORCE EIGHT    E.1********
352          IAR                                    E.1********
353          JAZ     D8TH06          SHIFT B ONCE   E.1********
354          IAR                                    E.1********
355          JAZ     D8TH03          SHIFT B TWICE  E.1********
356          ASRB    1                              E.1********
357          JMP     D8TH09                         E.1********
358 D8TH01   LDBI    8               USE 8          E.1********
359          JMP     D8TH11                         E.1********
360 D8TH03   ASRB    1                              E.1********
361 D8TH06   ASRB    1                              E.1********
362 D8TH09   TBA                                    E.1********
363          TZB                                    E.1********
364          LASR    1                              E.1********
365          JBZ     D8TH10                         E.1********
366          IAR                                    E.1********
367 D8TH10   TAB                                    E.1********
368 D8TH11   LDAE    DTANU,2                        E.1********
369          STA     D8TH12          SET ARCTAN ADDR E.1********
370          ASLB    1               FORCE V TO NEAREST EIGHTH E.1********
371          LDAE    V8TH,2                         E.1********
372          STA     U                              E.1********
373          LDAE    V8TH+1,2                       E.1********
374          STA     U+1                            E.1********
375 **********************                          E.1********
376 * TAN-1((U-V)/(1+U*V)) *                         E.1********
377 **********************                          E.1********
378          FLDD                                   E.1********
379          DATA    V                              E.1********
380          FMUD                                   E.1********
381          DATA    U                              E.1********
382          FADD                                   E.1********
383          DATA    ONE                            E.1********
384          FSTD                                   E.1********
385          DATA    TEMP                           E.1********
386          FLDD                                   E.1********
387          DATA    V                              E.1********
388          FSBD                                   E.1********
389          DATA    U                              E.1********
390          FDVD                                   E.1********
391          DATA    TEMP                           E.1********
392          FSTD                                   E.1********
393          DATA    Z                              E.1********
394 **********************                          E.1********
395 * CALCULATE Z**2 *                              E.1********
396 **********************                          E.1********
397          FLDD                                   E.1********
398          DATA    Z                              E.1********
399          FMUD                                   E.1********
400          DATA    Z                              E.1********
401          FSTD                                   E.1********
402          DATA    R                              E.1********
403 **********************                          E.1********
404 * CALCULATE ARCTAN *                            E.1********
405 **********************                          E.1********
406          FLDD                                   E.1********
407          DATA    A4                             E.1********
408          FMUD                                   E.1********
409          DATA    R                              E.1********
410          FADD                                   E.1********
411          DATA    A3                             E.1********
412          FMUD                                   E.1********
413          DATA    R                              E.1********
414          FADD                                   E.1********
415          DATA    A2                             E.1********
416          FMUD                                   E.1********
417          DATA    R                              E.1********
418          FADD                                   E.1********
419          DATA    A1                             E.1********
420          FMUD                                   E.1********
421          DATA    R                              E.1********
422          FADD                                   E.1********
423          DATA    A0                             E.1********
424          FMUD                                   E.1********
425          DATA    Z                              E.1********
426          FADD                                   E.1********
427 D8TH12   BSS     1                              E.1********
428          FSBD                                   E.1********
429 D8TH18   BSS     1                              E.1********
430          FMUD                                   E.1********
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                431 D8TH21  DATA    1                                                                E.1*********
                432         FSTD                                                                     E.1*********
                433         DATA    AC                                                               E.1*********
                434         LDA                                                                      E.1*********
                435         LDB                                                                      E.1*********
                436         LDX                                                                      E.1*********
                437         JMP*    $DAT                                                             E.1*********
                438 DAT030  LDXI    ZERO          NO CONSTANT ADDED                                  E.1*********
                439         LDAI    ONE                                                              E.1*********
                440         JBZ     DAT020        NO SIGN CHANGE                                     E.1*********
                441         JMP     DAT015        USE -1 TO CONVERT SIGN                             E.1*********
                442 DTANU   DATA    DT00,DT18,DT14,DT38,DT12,DT58,DT34,DT78,DT1                      E.1*********
                443 DT1     DATA    0200,062207,073250,042055          .785398163397448309D0         E.1*********
                444 DT78    DATA    0200,056002,047612,074106          .718829999621624505D0         E.1*********
                445 DT34    DATA    0200,051136,017506,023237          .643501108793284386D0         E.1*********
                446 DT58    DATA    0200,043600,013527,057377          .558599315343562436D0         E.1*********
                447 DT12    DATA    0177,073261,047012,060673          .463647609000806116D0         E.1*********
                448 DT38    DATA    0177,055730,031203,062337          .358770670270572220D0         E.1*********
                449 DT14    DATA    0176,076555,065762,026201          .244978663126864154D0         E.1*********
                450 DT18    DATA    0175,077526,072465,026057          .124354994546761435D0         E.1*********
                451 ZERO    BSS     0                                                                E.1*********
                452 DT00    DATA    0,0,0,0                              .0                          E.1*********
                453 A0      DATA    0201,040000,0,0                    .999999999999984020D0         E.1*********
                454 A1      DATA    0177,0125252,025252,052305        -.333333333312842320D0         E.1*********
                455 A2      DATA    0176,063146,031441,012502          .199999995801153276D0         E.1*********
                456 A3      DATA    0176,0133333,013232,07433         -.142854130388704964D0         E.1*********
                457 A4      DATA    0175,070337,051326,036035          .110228146243221206D0         E.1*********
                458 V8TH    DATA    0,0                                  0                           E.1*********
                459         DATA    0176,040000                          1/8                         E.1*********
                460         DATA    0177,040000                          2/8                         E.1*********
                461         DATA    0177,060000                          3/8                         E.1*********
                462         DATA    0200,040000                          4/8                         E.1*********
                463         DATA    0200,050000                          5/8                         E.1*********
                464         DATA    0200,060000                          6/8                         E.1*********
                465         DATA    0200,070000                          7/8                         E.1*********
                466 ONE     DATA    0201,040000,0,0                      1                           E.1*********
                467 MONE    DATA    0201,0137777,0,0                     -1.0                        E.1*********
                468 TEMP    BSS     4                   TEMPORARY STORAGE                            E.1*********
                469 PIOVR2  DATA    0201,062207,073250,042055            1.570796326794              E.1*********
                470 U       BSS     4                                                                E.1*********
                471 V       BSS     4                                                                E.1*********
                472 R       BSS     4                                                                E.1*********
                473 Z       BSS     4                                                                E.1*********
                474 DASOFT  CONT                                                                     E.1*********
                475         END                                                                        03 00297

ENTRY NAMES
000015 R $DAN   000000 R DATAN
EXTERNAL NAMES
000147 E $DLO   000002 E $SE    000155 E $STO   000152 E $ZK
000103 E $ZL    000137 E $ZM    000062 E $ZN    000107 E AC
000160 E IF     000132 E POLY
SYMBOLS
000015 R $DAN   000015 R $DAT   000147 E $DLO   000002 E $SE
000155 E $STO   000152 E $ZK    000103 E $ZL    000137 E $ZM
000062 E $ZN    000107 E AC     000232 R DAAA   000165 R DAN1
000201 R DAP2   000205 R DAP2M  000004 R DARG   000016 R DAT01
000056 R DAT1   000050 R DAT1X  000067 R DAT2   000053 R DAT2X
000146 R DAT3   000043 R DAT3X  000113 R DAT4   000101 R DAT5
000141 R DAT6   000120 R DAT7   000000 R DATAN  000225 R DATE
000175 R DATM   000215 R DATP   000211 R DATQ   000221 R DATS
000231 R DATX   000171 R DATZ   000160 E IF      000020 A NBIT
000132 E POLY   000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE

  133   $DAN      20
  134   $DAT     129   231   437
    0   $DLO      43    44
    0   $SE       29    30
    0   $STO      58    59
    0   $ZK       72    73
    0   $ZL       86    87
    0   $ZM       99   100
    0   $ZN      113   114
  453   A0       423
  454   A1       419
  455   A2       415
  456   A3       411
  457   A4       407
    0   AC        50   139   191   193   211   218   229   433
  358   D8TH01   351
  360   D8TH03   355
  361   D8TH06   353
  362   D8TH09   350   357
  367   D8TH10   365
  368   D8TH11   344   346   359
  427   D8TH12   369
  429   D8TH18   337
  431   D8TH21   336
  266   DAAA     213
  304   DAFPP    144
  245   DAN1     153   236
  248   DAP2     165
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249	DAP2M	162							
127	DARG	131							
474	DASOFT	307							
141	DAT01	132							
318	DAT010	314							
335	DAT015	441							
336	DAT020	334	440						
438	DAT030	326							
164	DAT1X	160							
175	DAT2	239	239						
166	DAT2X	163							
232	DAT3	160	160						
161	DAT3X	239							
194	DAT4	193	193						
183	DAT5	180							
222	DAT6	197							
198	DAT7	193							
124	DATAN	11	20	128					
261	DATE	186							
247	DATM	170	182						
258	DATP	155	160	204	209	213	238	239	
257	DATQ	145	150	172	174	177	179	196	200
		202	221	234					
259	DATS	159	167	224					
264	DATX	178	184						
246	DATZ	157							
452	DT00	442							
443	DT1	442							
447	DT12	442							
449	DT14	442							
450	DT18	442							
445	DT34	442							
448	DT38	442							
446	DT58	442							
444	DT78	442							
442	DTANU	368							
32	FRMWR1	28	42	57	71	85	98	112	137
148		189	207	216	227				
34	FRMWR2	31	45	60	74	88	101	115	
0	IF	121	160	193	239				
467	MONE	335							
122	NBIT	243	260	262	267				
466	ONE	319	328	333	383	439			
469	PIOVR2	324							
0	POLY	121	213						
472	R	402	409	413	417	421			
468	TEMP	323	325	385	391				
470	U	372	374	381	389				
471	V	308	313	317	321	330	332	341	348
379		387							
458	V8TH	371	373						
1	VORTEX	26	27	40	41	55	56	69	70
83		84	96	97	110	111	135	136	142
143		146	147	187	188	205	206	214	215
225		226	305	306					
473	Z	393	398	400	425				
451	ZERO	438							

```
000001 A     1 VORTEX SET     1                                                                  03 00001
             2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE          03 00002
             3 *                                                                                03 00003
             4 *    V.D.M.  PART  NO.          92L0506-150E                                     03 00004
             5 *                                                                               03 00005
             6 *                                          RELEASE      10-15-73                 03 00006
             7 *                                                                               03 00007
             8 *                DEXP                                                           03 00008
             9 *                                                                               03 00009
            10 *                                                                               03 00010
            11          TITLE   DEXP                                                          03 00011
            12 ************************************************************************       03 00012
            13 *                                                                     *         03 00013
            14 *       D O U B L E - P R E C I S I O N  E X P O N E N T I A L        *         03 00014
            15 *                                                                     *         03 00015
            16 *                        ( D E X P , $ D E X )                        *         03 00016
            17 *                                                                     *         03 00017
            18 * FUNCTION: TO COMPUTE THE EXPONENTIAL OF A DOUBLE-PRECISION         *         03 00018
            19 *           ARGUMENT.                                                 *         03 00019
            20 *                                                                     *         03 00020
            21 * ENTRY: DEXP: NO SPECIAL CONDITIONS                                 *         03 00021
            22 *        $DEX: AC=DP ARGUMENT                                        *         03 00022
            23 *                                                                     *         03 00023
            24 * CALLING SEQ: DEXP: JMPM DEXP                                      *         03 00024
            25 *                      DATA ADDRESS OF DP ARGUMENT                    *         03 00025
            26 *                                                                     *         03 00026
            27 *                $DEX: JMPM $DEX                                     *         03 00027
            28 *                                                                     *         03 00028
            29 * EXIT: AC=E**ARG                                                    *         03 00029
            30 *                                                                     *         03 00030
            31 * ERRORS: OVERFLOW: OUTPUT 'FUNC ARG'                               *         03 00031
            32 *                    AC=MAX DP NUMBER                                 *         03 00032
            33 *          UNDERFLOW: AC=0                                           *         03 00033
            34 *          BOTH: OVFL SET                                            *         03 00034
            35 *                                                                     *         03 00035
            36 ************************************************************************       03 00036
            38 ***********                                                                    03 00038
            39 * ENTRIES *                                                                    03 00039
            40 ***********                                                                    03 00040
            41          NAME    DEXP            ARG IN CALL SEQ                            03 00041
            42          NAME    $DEX            ARG IN AC                                  03 00042
            44 *************                                                                  03 00044
            45 * EXTERNALS *                                                                 03 00045
            46 *************                                                                  03 00046
            48 * DOUBLE PRECISION LOAD                                                  D.103 00048
            49 FLDD     MAC                                                            D.103 00049
            50          IFT     VORTEX-3                                               D.103 00050
            51          IFF     VORTEX-4                                               D.103 00051
            52          GOTO    FRMWR1                                                 D.103 00052
            53          EXT     $DLD            DP LOAD                                D.103 00053
            54          CALL    $DLD                                                   D.103 00054
            55          GOTO    FRMWR2                                                 D.103 00055
            56 FRMWR1   CONT                                                           D.103 00056
            57          DATA    0105522         FPP DP LOAD                            D.103 00057
            58 FRMWR2   CONT                                                           D.103 00058
            59          EMAC                                                           D.103 00059
            60          EXT     AC              DP ACCUMULATOR                         D.103 00060
            62          EXT     $DNO            NORMALIZE DP ARG                          03 00062
            63          EXT     $EE             ERROR MESSAGE PROCESSOR                   03 00063
            65 * DOUBLE PRECISION STORE                                                D.103 00065
            66 FSTD     MAC                                                            D.103 00066
            67          IFT     VORTEX-3                                               D.103 00067
            68          IFF     VORTEX-4                                               D.103 00068
            69          GOTO    FRMWR1                                                 D.103 00069
            70          EXT     $STO                                                   D.103 00070
            71          CALL    $STO            DP STORE                               D.103 00071
            72          GOTO    FRMWR2                                                 D.103 00072
            73 FRMWR1   CONT                                                           D.103 00073
            74          DATA    0105710         FPP DP STORE                           D.103 00074
            75 FRMWR2   CONT                                                           D.103 00075
            76          EMAC                                                           D.103 00076
            78          EXT     $ZC             NEGATE AC                                 03 00078
            80 * DOUBLE PRECISION ADD                                                  D.103 00080
            81 FADD     MAC                                                            D.103 00081
            82          IFT     VORTEX-3                                               D.103 00082
            83          IFF     VORTEX-4                                               D.103 00083
            84          GOTO    FRMWR1                                                 D.103 00084
            85          EXT     $ZK                                                    D.103 00085
            86          CALL    $ZK             DP ADD                                 D.103 00086
            87          GOTO    FRMWR2                                                 D.103 00087
            88 FRMWR1   CONT                                                           D.103 00088
            89          DATA    0105503         FPP DP ADD                             D.103 00089
            90 FRMWR2   CONT                                                           D.103 00090
            91          EMAC                                                           D.103 00091
            94 * DOUBLE PRECISION SUBTRACT                                             D.103 00094
            95 FSBD     MAC                                                            D.103 00095
            96          IFT     VORTEX-3                                               D.103 00096
            97          IFF     VORTEX-4                                               D.103 00097
            98          GOTO    FRMWR1                                                 D.103 00098
            99          EXT     $ZL                                                    D.103 00099
           100          CALL    $ZL             DP SUBTRACT                            D.103 00100
           101          GOTO    FRMWR2                                                 D.103 00101
           102 FRMWR1   CONT                                                           D.103 00102
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                    103          DATA    0105543        FPP DP SUBTRACT                  D.103 00103
                    104 FRMWR2   CONT                                                    D.103 00104
                    105          EMAC                                                     D.103 00105
                    108 * DOUBLE PRECISION MULTIPLY                                       D.103 00108
                    109 FMUD     MAC                                                      D.103 00109
                    110          IFT     VORTEX-3                                         D.103 00110
                    111          IFF     VORTEX-4                                         D.103 00111
                    112          GOTO    FRMWR1                                           D.103 00112
                    113          EXT     $ZM                                              D.103 00113
                    114          CALL    $ZM            DP MULTIPLY                       D.103 00114
                    115          GOTO    FRMWR2                                           D.103 00115
                    116 FRMWR1   CONT                                                     D.103 00116
                    117          DATA    0105506                                          D.103 00117
                    118 FRMWR2   CONT                                                     D.103 00118
                    119          EMAC                                                     D.103 00119
                    122 * DOUBLE PRECISION DIVIDE                                         D.103 00122
                    123 FDVD     MAC                                                      D.103 00123
                    124          IFT     VORTEX-3                                         D.103 00124
                    125          IFF     VORTEX-4                                         D.103 00125
                    126          GOTO    FRMWR1                                           D.103 00126
                    127          EXT     $ZN                                              D.103 00127
                    128          CALL    $ZN            DP DIVIDE                         D.103 00128
                    129          GOTO    FRMWR2                                           D.103 00129
                    130 FRMWR1   CONT                                                     D.103 00130
                    131          DATA    0105535        FPP DP DIVIDE                     D.103 00131
                    132 FRMWR2   CONT                                                     D.103 00132
                    133          EMAC                                                     D.103 00133
                    136 *********                                                           03 00136
                    137 * MACRO *                                                          03 00137
                    138 *********                                                           03 00138
                    139 FSE      MAC                                                        03 00139
                    140          IFT     VORTEX-2                                         D.103 00140
                    141          IFF     VORTEX-4                                         D.103 00141
                    142          GOTO    FRMWR1                                           D.103 00142
                    143          EXT     $SE                                              D.103 00143
                    144          CALL    $SE            XFER PARAMETERS                   D.103 00144
                    145          GOTO    FRMWR2                                           D.103 00145
                    146 FRMWR1   CONT                                                     D.103 00146
                    147          DATA    0105036        BCS XFER PARAMETERS               D.103 00147
                    148 FRMWR2   CONT                                                     D.103 00148
                    149          EMAC                                                       03 00149
                    152 ***********                                                         03 00152
                    153 * SET BLOCK *                                                       03 00153
                    154 ***********                                                         03 00154
000022 A            155 $BIT     SET     18             PUT LAST FOR 18-BIT                03 00155
000020 A            156 $BIT     SET     16             PUT LAST FOR 16-BIT                03 00156
                    158 ************************************                                03 00159
                    159 * DEXP IS ENTRY WITH ARG IN CALL SEQ *                            03 00159
                    160 ************************************                                03 00160
000000 074337 A     161 DE       STX     DESX+1         SAVE X                             03 00161
000001 034014 A     162          LDX     DEP            GET POINTER TO DP ARG              03 00162
000002 074002 A     163          STX     DE01                                             V&103 00163
                    164          FLDD                                                     V&103 00164
000003 002000 A
000004 000000 E
000005              165 DE01     BSS     1                                                V&103 00165
                    166          IFT     VORTEX-1                                         V&103 00166
                    167          IFF     VORTEX-2                                         V&103 00167
                    168          GOTO    FRMWR1                                           V&103 00168
                    169          FSTD                                                     V&103 00169
                    170          DATA    AC                                               V&103 00170
                    171 FRMWR1   CONT                                                     V&103 00171
000006 002000 A     172          CALL    $DEX           COMPUTE AC=E**(AC)                 03 00172
000007 000021 R
000010 034327 A     173          LDX     DESX+1         RESTORE X                          03 00173
000011 001000 A     174          JMP     0              EXIT                               03 00174
000012 000000 A
000012              175 DEXP     BES     0              ENTRY                              03 00175
                    176          FSE                    XFER PARAMETERS                    03 00176
000013 002000 A
000014 000000 E
000015 000001 A     177          DATA    1                                                  03 00177
000016              178 DEP      BSS     1              POINTER TO DP ARG                  03 00178
000017 001000 A     179          JMP     DE             JUMP BACK FOR FORWARD REF          03 00179
000020 000000 R
                    180 ****************************************                            03 00180
                    181 * $DEX IS ENTRY WITH ARG IN DP ACCUM AC *                         03 00181
                    182 ****************************************                            03 00182
000021 000000 A     184 $DEX     ENTR                                                       03 00184
                    185          IFT     VORTEX-1                                         D.103 00185
                    186          IFF     VORTEX-2                                         D.103 00186
                    187          GOTO    FRMWR1                                           D.103 00187
                    188          FLDD                                                     V&103 00188
                    189          DATA    AC                                               V&103 00189
                    190 FRMWR1   CONT                                                     V&103 00190
000022 054311 A     191          STA     DESA           SAVE A                             03 00191
000023 064311 A     192          STB     DESB           SAVE B                             03 00192
000024 074312 A     193          STX     DESX           SAVE X                             03 00193
                    194 ********************                                                03 00194
                    195 * NORMALIZE ARG U *                                               03 00195
                    196 ********************                                              03 00196
                    197          FSTD                   STORE U                          V&103 00197
000025 002000 A
```

```
000026 000000 E
000027 000346 R  198          DATA     DEU                                          03 00198
000030 002000 A  199          CALL     $DNO      NORMALIZE U                        03 00199
000031 000000 E
000032 000346 R  200          DATA     DEU                                          03 00200
000033 014313 A  201          LDA      DEU+1                                        03 00201
000034 001010 A  202          JAZ      DEL1      EXIT WITH AC=1 IF U=0              03 00202
000035 000276 R
                 203 ************************                                      03 00203
                 204 * CHECK EXPONENT RANGE *                                      03 00204
                 205 ************************                                      03 00205
000036 014307 A  206          LDA      DEU       GET BINARY EXPONENT OF U           03 00206
000037 006140 A  207          SUBI     0210                                         03 00207
000040 000210 A
000041 001004 A  208          JAN      DE1       BINARY EXPONENT OF U .GT. 7 ?      03 00208
000042 000050 R
000043 014303 A  209          LDA      DEU+1     YES                                03 00209
000044 001002 A  210          JAP      DEOV      OVERFLOW IF U +                    03 00210
000045 000303 R
000046 001000 A  211          JMP      DEUN      UNDERFLOW IF -                     03 00211
000047 000315 R
                 212 ************************                                      03 00212
                 213 * COMPUTE Y=U/LN(2) *                                        03 00213
                 214 ************************                                      03 00214
                 215 DE1      FLDD                LOAD NORMALIZED U              V&103 00215
000050 002000 A
000051 000004 E
000052 000346 R  216          DATA     DEU                                          03 00216
                 217          FDVD                COMPUTE Y=U/LN(2)              V&103 00217
000053 002000 A
000054 000000 E
000055 000413 R  218          DATA     DEL2                                         03 00218
                 219          FSTD                STORE IN DEY                   V&103 00219
000056 002000 A
000057 000026 E
000060 000346 R  220          DATA     DEY                                          V&103 00220
                 221          IFT      VORTEX-1                                     V&103 00221
                 222          IFF      VORTEX-2                                     V&103 00222
                 223          GOTO     FRMWR1                                       V&103 00223
                 224          FLDD                                                  V&103 00224
                 225          DATA     DEY                                          V&103 00225
                 226 FRMWR1   CONT                                                  V&103 00226
                 227 ********************************                              03 00227
                 228 * COMPUTE N=INT(Y+(1/2)*SIGN(U)) *                            03 00228
                 229 ********************************                              03 00229
000061 024322 A  230          LDB      DED1+1    SET HIGH BIT IN B                  03 00230
000062 014264 A  231          LDA      DEY+1                                        03 00231
000063 001002 A  232          JAP      *+3       IS U NEGATIVE ?                    03 00232
000064 000066 R
000065 005222 A  233          CPB                YES, SET DEH TO -1/2               03 00233
000066 064242 A  234          STB      DEH+1     SET DEH TO + OR -(1/2)             03 00234
                 235          FADD                COMPUTE Y+-(1/2)               V&103 00235
000067 002000 A
000070 000000 E
000071 000330 R  236          DATA     DEH                                          03 00236
                 237          FSTD                STORE IN DET                   V&103 00237
000072 002000 A
000073 000057 E
000074 000342 R  238          DATA     DET                                          03 00238
000075 005002 A  239          TZB                                                   03 00239
000076 064245 A  240          STB      DET+2     CLEAR WORDS 2 AND 3                03 00240
000077 064245 A  241          STB      DET+3                                        03 00241
000100 014241 A  242          LDA      DET                                          03 00242
000101 144226 A  243          SUB      DEH                                          03 00243
000102 001010 A  244          JAZ      *+4       IS THERE AN INTEGER PART ?         03 00244
000103 000106 R
000104 001002 A  245          JAP      DE1A                                         V&103 00245
000105 000111 R
000106 064234 A  246          STB      DET+1     NO. SET N=0                        03 00246
                 247          IFT      VORTEX-1                                     D.103 00247
                 248          IFF      VORTEX-2                                     D.103 00248
                 249          GOTO     FRMWR1                                       D.103 00249
                 250          STB      DET                                          V&103 00250
                 251 FRMWR1   CONT                                                  V&103 00251
000107 001000 A  252          JMP      DE3                                          03 00252
000110 000142 R
000111 054227 A  253 DE1A     STA      DET1      YES                                V&103 00253
000112 124223 A  254          ADD      DESH      CONSTRUCT MASK SHIFT               03 00254
000113 054006 A  255          STA      DE2       STORE IN LINE                      03 00255
000114 006010 A  256          LDAI     $BIT-1                                       03 00256
000115 000017 A
000116 144222 A  257          SUB      DET1                                         03 00257
000117 124216 A  258          ADD      DESH      CONSTRUCT FIX SHIFT                03 00258
000120 054017 A  259          STA      DE2X      STORE IN LINE                      03 00259
000121 014234 A  260          LDA      DESI      LOAD SIGN BIT                      03 00260
000122 004300 A  261 DE2      ASRA     0         SHIFT MASK                         03 00261
000123 054215 A  262          STA      DET1      SAVE MASK                          03 00262
000124 014216 A  263          LDA      DET+1     GET MANTISSA FIRST WORD            03 00263
000125 004020 A  264          LASR     1BIT                                         03 00264
000126 005012 A  265          TAB                GET SIGN FLAG IN B                 03 00265
000127 014213 A  266          LDA      DET+1     RELOAD MANTISSA WORD 1             03 00266
000130 001020 A  267          JBZ      *+3       NEGATIVE ?                         03 00267
000131 000133 R
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000132 005211 A  268          CPA                                YES, MAKE +                                    03 00268
000133 154205 A  269          ANA      DET1                      MASK OFF FRACTION                              03 00269
000134 001020 A  270          JBZ      *+3                       NEGATIVE ?                                     03 00270
000135 000137 R
000136 005211 A  271          CPA                                YES, MAKE -                                    03 00271
000137 054203 A  272          STA      DET+1                     CLEAR FRACTIONAL PART                          03 00272
000140 004300 A  273 DE2X     ASRA     0                         FIX INTEGER                                    03 00273
000141 005012 A  274          TAB                                                                               03 00274
000142 064214 A  275 DE3      STB      DE2N                      STORE IN EXPONENT FIELD OF 2**N                03 00275
                 276 ********************                                                                       03 00276
                 277 * COMPUTE W=Y-N *                                                                         03 00277
                 278 ********************                                                                       03 00278
                 279          FLDD                               RELOAD Y                                     V&103 00279
000143 002000 A
000144 000051 E
000145 000346 R  280          DATA     DEY                                                                     03 00280
                 281          FSBD                               GET Y-N                                      V&103 00281
000146 002000 A
000147 000000 E
000150 000342 R  282          DATA     DET                                                                     03 00282
                 283 ************************                                                                 03 00283
                 284 * COMPUTE X=W*LN(2) *                                                                     03 00284
                 285 ************************                                                                 03 00285
                 286          FMUD                               X=W*LN(2)                                    V&103 00286
000151 002000 A
000152 000000 E
000153 000413 R  287          DATA     DEL2                                                                    03 00287
                 288          FSTD                               STORE X IN DEX                               V&103 00288
000154 002000 A
000155 000073 E
000156 000346 R  289          DATA     DEX                                                                     03 00289
                 290          IFT      VORTEX-1                                                                D.103 00290
                 291          IFF      VORTEX-2                                                                D.103 00291
                 292          GOTO     FRMWR1                                                                  D.103 00292
                 293          FLDD                                                                             V&103 00293
                 294          DATA     DEX                                                                     V&103 00294
                 295 FRMWR1   CONT                                                                             V&103 00295
                 296          FMUD                               GET Z=X**2                                   V&103 00296
000157 002000 A
000160 000152 E
000161 000346 R  297          DATA     DEX                                                                     03 00297
                 298          FSTD                               STORE IN DEX2                                V&103 00298
000162 002000 A
000163 000155 E
000164 000352 R  299          DATA     DEX2                                                                    03 00299
                 300 ************************************************                                         03 00300
                 301 * COMPUTE DENOMINATOR B3=15120+420*X**2+X**4 *                                           03 00301
                 302 ************************************************                                         03 00302
                 303          IFT      VORTEX-1                                                                D.103 00303
                 304          IFF      VORTEX-2                                                                D.103 00304
                 305          GOTO     FRMWR1                                                                  D.103 00305
                 306          FLDD                                                                             V&103 00306
                 307          DATA     DEX2                                                                    V&103 00307
                 308 FRMWR1   CONT                                                                             V&103 00308
                 309          FADD                               GET 420+X**2                                 V&103 00309
000165 002000 A
000166 000070 E
000167 000377 R  310          DATA     DEB2                                                                    03 00310
                 311          FMUD                               GET (420+X**2)*X**2                          V&103 00311
000170 002000 A
000171 000160 E
000172 000352 R  312          DATA     DEX2                                                                    03 00312
                 313          FADD                               GET B3                                       V&103 00313
000173 002000 A
000174 000166 E
000175 000373 R  314          DATA     DEB1                                                                    03 00314
                 315          FSTD                               STORE IN TEMP                                V&103 00315
000176 002000 A
000177 000163 E
000200 000342 R  316          DATA     DET                                                                     03 00316
                 317 ************************************                                                     03 00317
                 318 * COMPUTE NUMERATOR A3=2520+28*X**2 *                                                    03 00318
                 319 ************************************                                                     03 00319
                 320          FLDD                               LOAD X**2                                    V&103 00320
000201 002000 A
000202 000144 E
000203 000352 R  321          DATA     DEX2                                                                    03 00321
                 322          FMUD                               GET 28*X**2                                  V&103 00322
000204 002000 A
000205 000171 E
000206 000367 R  323          DATA     DEA2                                                                    03 00323
                 324          FADD                               GET A3                                       V&103 00324
000207 002000 A
000210 000174 E
000211 000363 R  325          DATA     DEA1                                                                    03 00325
                 326          FDVD                               GET A3/B3                                    V&103 00326
000212 002000 A
000213 000054 E
000214 000342 R  327          DATA     DET                                                                     03 00327
                 328 ************************                                                                 03 00328
                 329 * COMPUTE F=X**2(A3/B3) *                                                                03 00329
                 330 ************************                                                                 03 00330
                 331          FMUD                               GET F                                        V&103 00331
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000215 002000 A
000216 000205 E
000217 000352 R   332          DATA    DEX2                                                    03 00332
                  333 **************                                                             03 00333
                  334 * GET S=2+F  *                                                          03 00334
                  335 **************                                                          03 00335
                  336          FADD                    GET S                                 V&103 00336
000220 002000 A
000221 000210 E
000222 000407 R   337          DATA    DED2                                                    03 00337
                  338          FSTD                    SAVE                                  V&103 00338
000223 002000 A
000224 000177 E
000225 000342 R   339          DATA    DET                                                     03 00339
                  340 ************************                                                03 00340
                  341 * GET E**X=(S+X)/(S-X) *                                                03 00341
                  342 ************************                                                03 00342
                  343          IFT     VORTEX-1                                              D.103 00343
                  344          IFF     VORTEX-2                                              D.103 00344
                  345          GOTO    FRMWR1                                                D.103 00345
                  346          FLDD                                                          V&103 00346
                  347          DATA    DET                                                   V&103 00347
                  348 FRMWR1   CONT                                                          V&103 00348
                  349          FSBD                    GET S-X                               V&103 00349
000226 002000 A
000227 000147 E
000230 000346 R   350          DATA    DEX                                                     03 00350
                  351          FSTD                    SAVE                                  V&103 00351
000231 002000 A
000232 000224 E
000233 000352 R   352          DATA    DEX2                                                    03 00352
                  353          FLDD                    RELOAD S                              V&103 00353
000234 002000 A
000235 000202 E
000236 000342 R   354          DATA    DET                                                     03 00354
                  355          FADD                    GET STX                               V&103 00355
000237 002000 A
000240 000221 E
000241 000346 R   356          DATA    DEX                                                     03 00356
                  357          FDVD                    GET F**X                              V&103 00357
000242 002000 A
000243 000213 E
000244 000352 R   358          DATA    DEX2                                                    03 00358
                  359 **************                                                          03 00359
                  360 * TEST IF N=0 *                                                         03 00360
                  361 **************                                                          03 00361
000245 014111 A   362          LDA     DE2N                                                    03 00362
000246 001010 A   363          JAZ     DEZ             EXIT IF N=0                             03 00363
000247 000270 R
000250 001002 A   364          JAP     *+3                                                     03 00364
000251 000253 R
000252 005111 A   365          IAR                     CONVERT NEG FROM 1 TO 2 COMP            03 00365
000253 124047 A   366          ADD     K201            BIAS EXPONENT                           03 00366
000254 001004 A   367          JAN     DEUN            TEST UNDERFLOW                          03 00367
000255 000315 R
000256 054100 A   368          STA     DE2N            2**N TO DE2N                            03 00368
000257 006140 A   369          SUBI    0400                                                    03 00369
000260 000400 A
000261 001002 A   370          JAP     DEOV            TEST FOR OVERFLOW                       03 00370
000262 000303 R
                  371          FMUD                                                          V&103 00371
000263 002000 A
000264 000216 E
000265 000357 R   372          DATA    DE2N                                                    03 00372
                  373          IFT     VORTEX-3                                              V&103 00373
                  374          IFF     VORTEX-4                                              V&103 00374
                  375          GOTO    FRMWR1                                                V&103 00375
000266 001001 A   376          JOF     DEUN            TEST FOR UNDERFLOW                    V&103 00376
000267 000315 R
                  377 FRMWR1   CONT                                                          V&103 00377
                  378 ************************                                                03 00378
                  379 * RELOAD REGS AND EXIT *                                               03 00379
                  380 ************************                                                03 00380
000270 007400 A   381 DEZ      ROF                     RESET OVFL TO FLAG NO ERROR           03 00381
                  382          IFT     VORTEX-1                                              D.103 00382
                  383          IFF     VORTEX-2                                              D.103 00383
                  384          GOTO    FRMWR1                                                D.103 00384
                  385          FSTD                                                          V&103 00385
                  386          DATA    AC                                                    V&103 00386
                  387 FRMWR1   CONT                                                          V&103 00387
000271 014042 A   388          LDA     DESA            RESTORE A                               03 00388
000272 024042 A   389          LDB     DESB            RESTORE B                               03 00389
000273 034043 A   390          LDX     DESX            RESTORE X                               03 00390
000274 001000 A   391          JMP*    $DLX            EXIT                                    03 00391
000275 100021 R
                  392 **********                                                              03 00392
                  393 * LOAD 1 *                                                             03 00393
                  394 **********                                                              03 00394
                  395 DEL1     FLDD                                                          V&103 00395
000276 002000 A
000277 000235 E
000300 000403 R   396          DATA    DED1                                                    03 00396
000301 001000 A   397          JMP     DEZ                                                     03 00397
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000302 000270 R
                    398 ************
                    399 * OVERFLOW *                                                          03 00398
                    400 ************                                                          03 00399
                                                                                            03 00400
000303 005002 A     401 DEOV    TZB                 SET B=0 TO RETURN                       03 00401
000304 006010 A     402         LDAI    2                                                   03 00402
000305 000002 A
000306 002000 A     403         CALL    $EE         OUTPUT MESSAGE 'FUNC ARG'               03 00403
000307 000000 E
                    404         FLDD                LOAD MAX NUMBER                     V&103 00404
000310 002000 A
000311 000277 E
000312 000417 R     405         DATA    DEMX                                                03 00405
000313 001000 A     406         JMP     DEUN1                                           V&103 00406
000314 000320 R
                    407 ************                                                        03 00407
                    408 * UNDERFLOW *                                                      03 00408
                    409 ************                                                        03 00409
                    410 DEUN    FLDD                SET AC=0                            V&103 00410
000315 002000 A
000316 000311 E
000317 000324 R     411         DATA    DFD0                                                03 00411
000320 007401 A     412 DEUN1   SOF                 SET OVFL TO FLAG ERROR              V&103 00412
000321 001000 A     413         JMP     DEZ+1                                               03 00413
000322 000271 R
                    414 ****************************                                        03 00414
                    415 * CONSTANTS AND VARIABLES *                                        03 00415
                    416 ****************************                                        03 00416
000323 000201 A     417 K201    DATA    0201                                                03 00417
000324 000000 A     418 DED0    DATA    0           DOUBLE-PRECISION ZERO                   03 00418
000325 000000 A     419         DATA    0                                                   03 00419
000326 000000 A     420         DATA    0                                                   03 00420
000327 000000 A     421         DATA    0                                                   03 00421
000330 000200 A     422 DEH     DATA    0200        DOUBLE-PRECISION 1/2                    03 00422
000331 000000 A     423         DATA    0                                                   03 00423
000332 000000 A     424         DATA    0                                                   03 00424
000333 000000 A     425         DATA    0                                                   03 00425
000334              426 DESA    BSS     1           SAVE A                                  03 00426
000335              427 DESB    BSS     1           SAVE B                                  03 00427
000336 004300 A     428 DESH    ASRA    0           DUMMY SHIFT                             03 00428
000337              429 DESX    BSS     2           SAVE X                                  03 00429
000341              430 DET1    BSS     1           TEMP STORE                              03 00430
000342              431 DET     BSS     4           TEMP DP CELL                            03 00431
000346              432 DEU     BSS     4           ARGUMENT U                              03 00432
000352              433 DEX2    BSS     4           Z=X**2                                  03 00433
            000346 R 434 DEY    EQU     DEU         Y=U/(LN(2))                             03 00434
            000346 R 435 DEX    EQU     DEU                                                 03 00435
                    436         IFT     $BIT-16                                             03 00436
                    437         GOTO    Z1                                                  03 00437
000356 100000 A     438 DESI    DATA    0100000     16-BIT SIGN BIT                         03 00438
000357 000000 A     439 DE2N    DATA    0           16-BIT 2**N                             03 00439
000360 040000 A     440         DATA    040000                                              03 00440
000361 000000 A     441         DATA    0                                                   03 00441
000362 000000 A     442         DATA    0                                                   03 00442
000363 000214 A     443 DEA1    DATA    0214        16-BIT 2520                             03 00443
000364 047300 A     444         DATA    047300                                              03 00444
000365 000000 A     445         DATA    0                                                   03 00445
000366 000000 A     446         DATA    0                                                   03 00446
000367 000205 A     447 DEA2    DATA    0205,070000,0,0         16-BIT 28               E.1 ********
000370 070000 A
000371 000000 A
000372 000000 A
000373 000216 A     448 DEB1    DATA    0216,073040,0,0         16-BIT 15,120           E.1 ********
000374 073040 A
000375 000000 A
000376 000000 A
000377 000211 A     449 DEB2    DATA    0211        16-BIT 420                              03 00455
000400 064400 A     450         DATA    064400                                              03 00456
000401 000000 A     451         DATA    0                                                   03 00457
000402 000000 A     452         DATA    0                                                   03 00458
000403 000201 A     453 DED1    DATA    0201        16-BIT DOUBLE-PRECISION 1               03 00459
000404 040000 A     454         DATA    040000                                              03 00460
000405 000000 A     455         DATA    0                                                   03 00461
000406 000000 A     456         DATA    0                                                   03 00462
000407 000202 A     457 DED2    DATA    0202        16-BIT DOUBLE-PRECISION 2               03 00463
000410 040000 A     458         DATA    040000                                              03 00464
000411 000000 A     459         DATA    0                                                   03 00465
000412 000000 A     460         DATA    0                                                   03 00466
000413 000200 A     461 DEL2    DATA    0200        16-BIT LN(2)=0.6931 47180 55994 53      03 00467
000414 054271 A     462         DATA    054271                                              03 00468
000415 002775 A     463         DATA    002775                                              03 00469
000416 075073 A     464         DATA    075073                                              03 00470
000417 000777 A     465 DEMX    DATA    000777      16-BIT MAX DP NUMBER                    03 00471
000420 077777 A     466         DATA    077777                                              03 00472
000421 077777 A     467         DATA    077777                                              03 00473
000422 077777 A     468         DATA    077777                                              03 00474
                    469 Z1      CONT                                                        03 00475
                    470         IFT     $BIT-18                                             03 00476
                    471         GOTO    Z2                                                  03 00477
                    472 DESI    DATA    0400000     18-BIT SIGN BIT                         03 00478
                    473 DE2N    DATA    0           18-BIT 2**N                             03 00479
                    474         DATA    0200000                                             03 00480
                    475         DATA    0                                                   03 00481
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```
                476          DATA    0                                                  03 00482
                477 DEA1     DATA    0214          18-BIT 2520                          03 00483
                478          DATA    0235400                                            03 00484
                479          DATA    0                                                  03 00485
                480          DATA    0                                                  03 00486
                481 DEA2     DATA    0206          18-BIT 28                            03 00487
                482          DATA    0160000                                            03 00488
                483          DATA    0                                                  03 00489
                484          DATA    0                                                  03 00490
                485 DEB1     DATA    0217          18-BIT 15,120                        03 00491
                486          DATA    0166100                                            03 00492
                487          DATA    0                                                  03 00493
                488          DATA    0                                                  03 00494
                489 DEB2     DATA    0211          18-BIT 420                           03 00495
                490          DATA    0322000                                            03 00496
                491          DATA    0                                                  03 00497
                492          DATA    0                                                  03 00498
                493 DED1     DATA    0201          18-BIT DOUBLE-PRECISION 1            03 00499
                494          DATA    0200000                                            03 00500
                495          DATA    0                                                  03 00501
                496          DATA    0                                                  03 00502
                497 DED2     DATA    0202          18-BIT DOUBLE-PRECISION 2            03 00503
                498          DATA    0200000                                            03 00504
                499          DATA    0                                                  03 00505
                500          DATA    0                                                  03 00506
                501 DEL2     DATA    0200          18-BIT LN(2)=0.6931 47180 55994 53   03 00507
                502          DATA    0261344                                            03 00508
                503          DATA    057737                                             03 00509
                504          DATA    0107025                                            03 00510
                505 DEMX     DATA    0377          18-BIT MAX DP NUMBER                 03 00511
                506          DATA    0377777                                            03 00512
                507          DATA    0377777                                            03 00513
                508          DATA    0377777                                            03 00514
                509 Z2       CONT                                                       03 00515
                510          END                                                        03 00516
ENTRY NAMES
000021 R $DEX    000012 R DEXP
EXTERNAL NAMES
000316 E $DLO    000031 E $DNO    000307 E $EE     000014 E $SE
000232 E $STO    000000 E $ZC     000240 E $ZK     000227 E $ZL
000264 E $ZM     000243 E $ZN     000000 E AC
SYMBOLS
000020 A $BIT    000021 R $DEX    000316 E $DLO    000031 E $DNO
000307 E $EE     000014 E $SE     000232 E $STO    000000 E $ZC
000240 E $ZK     000227 E $ZL     000264 E $ZM     000243 E $ZN
000000 E AC      000000 R DE      000005 R DE01    000050 R DE1
000111 R DE1A    000122 R DE2     000357 R DE2N    000140 R DE2X
000142 R DE3     000363 R DEA1    000367 R DEA2    000373 R DEB1
000377 R DEB2    000324 R DED0    000403 R DED1    000407 R DED2
000330 R DEH     000276 R DEL1    000413 R DEL2    000417 R DEMX
000303 R DEOV    000016 R DEP     000334 R DESA    000335 R DESB
000336 R DESH    000356 R DESI    000337 R DESX    000342 R DET
000341 R DET1    000346 R DEU     000315 R DEUN    000320 R DEUN1
000346 R DEX     000352 R DEX2    000012 R DEXP    000346 R DEY
000270 R DEZ     000323 R K201    000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE

  155  $BIT      256   264   436   470
  184  $DEX       42   172   391
    0  $DLO       53    54
    0  $DNO       62   199
    0  $EE        63   403
    0  $SE       143   144
    0  $STO       70    71
    0  $ZC        78
    0  $ZK        85    86
    0  $ZL        99   100
    0  $ZM       113   114
    0  $ZN       127   128
    0  AC         60   170   189   386
  161  DE        179
  165  DE01      163
  215  DE1       208
  253  DE1A      245
  261  DE2       255
  439  DE2N      275   362   368   372
  273  DE2X      259
  275  DE3       252
  443  DEA1      325
  447  DEA2      323
  448  DEB1      314
  449  DEB2      310
  418  DED0      411
  453  DED1      230   396
  457  DED2      337
  422  DEH       234   236   243
  395  DEL1      202
  461  DEL2      218   287
  465  DEMX      405
  401  DEOV      210   370
  178  DEP       162
  426  DESA      191   388
```

427 DESB 192 383
428 DESH 254 258
438 DESI 260
429 DESX 161 173 193 390
431 DET 238 240 241 242 246 250 263 266 272
282 316 327 339 347 354
430 DET1 253 257 262 269
432 DEU 198 200 201 206 209 216 434 435
410 DEUN 211 367 376
412 DEUN1 406
435 DEX 289 294 297 350 356
433 DEX2 299 307 312 321 332 352 358
175 DEXP 11 41
434 DEY 220 225 231 280
381 DEZ 363 397 413
56 FRMWR1 52 69 84 98 112 126 142 168 187
223 249 292 305 345 375 384
58 FRMWR2 55 72 87 101 115 129 145
417 K201 366
1 VORTEX 50 51 67 68 82 83 96 97 110
111 124 125 140 141 166 167 185 186
221 222 247 248 290 291 303 304 343
344 373 374 382 383
469 Z1 437
509 Z2 471

```
000001 A     1 VORTEX SET     1                                                                  03 00001
             2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE          03 00002
             3 *                                                                                03 00003
             4 *   V.D.M.  PART  NO.        92L0506-151D                                        03 00004
             5 *                                                                                03 00005
             6 *                                    RELEASE     10-15-73                        03 00006
             7 *                                                                                03 00007
             8 *              DLOG                                                              03 00008
             9 *                                                                                03 00009
            10 *                                                                                03 00010
            11         TITLE   DLOG                                                            03 00011
            12 ************************************************************************        03 00012
            13 *                                                                      *        03 00013
            14 *     D O U B L E - P R E C I S I O N   L O G   T O   B A S E   E      *        03 00014
            15 *                                                                      *        03 00015
            16 *                          ( $ D L N , D L O G )                       *        03 00016
            17 *                                                                      *        03 00017
            18 * FUNCTION: TO COMPUTE THE DOUBLE-PRECISION LOGARITH OF A DOUBLE-     *        03 00018
            19 *           PRECISION ARGUMENT U. THE METHOD IS TO FACTOR U THUS:     *        03 00019
            20 *                                                                     *        03 00020
            21 *           U = 2**N * M   (0.5.LE.M.LT.1)                            *        03 00021
            22 *                                                                     *        03 00022
            23 *           THEN LET X=(M-1/SQRT(2))/(M+1/SQRT(2))                    *        03 00023
            24 *           COMPUTE LN((1+X)/(1-X))=C0 + C1*X + ... + C6*X**6         *        03 00024
            25 *                                                                     *        03 00025
            26 *           THEN LN(U)=(N-1/2)*LN(2) + LN((1+X)/(1-X))                *        03 00026
            27 *                                                                     *        03 00027
            28 * ENTRY: $DLN:DP ARG IS IN DP ACCUM AC                                *        03 00028
            29 *        DLOG:DP ARG IN CALLING SEQUENCE                              *        03 00029
            30 *                                                                     *        03 00030
            31 * EXIT : AC=LN(U)                                                     *        03 00031
            32 *                                                                     *        03 00032
            33 * ERRORS: OVFL SET                                                    *        03 00033
            34 *         MESSAGE 'FUNC ARG' OUTPUT                                   *        03 00034
            35 *         AC=MAX(SIGNED) DP NUMBER IF EXPONENT OF U .GT. 0377         *        03 00035
            36 *           =MAX NEG DP NUMBER IF U.LE.0                              *        03 00036
            37 *                                                                     *        03 00037
            38 ************************************************************************        03 00038
            40 ***********                                                                     03 00040
            41 * ENTRIES *                                                                     03 00041
            42 ***********                                                                     03 00042
            43         NAME    $DLN            ARG IN DOUBLE-PRECISION ACCUMULATOR AC       03 00043
            44         NAME    DLOG            ARG IN CALLING SEQUENCE                      03 00044
            46 *************                                                                   03 00046
            47 * EXTERNALS *                                                                  03 00047
            48 *************                                                                   03 00048
            50 * DOUBLE PRECISION LOAD                                                 D.103 00050
            51 FLDD    MAC                                                            D.103 00051
            52         IFT     VORTEX-3                                               D.103 00052
            53         IFF     VORTEX-4                                               D.103 00053
            54         GOTO    FRMWR1                                                 D.103 00054
            55         EXT     $DLO            DP LOAD                                D.103 00055
            56         CALL    $DLO                                                   D.103 00056
            57         GOTO    FRMWR2                                                 D.103 00057
            58 FRMWR1  CONT                                                           D.103 00058
            59         DATA    0105522         FPP DP LOAD                            D.103 00059
            60 FRMWR2  CONT                                                           D.103 00060
            61         EMAC                                                           D.103 00061
            62         EXT     AC              DP ACCUMULATOR                         D.103 00062
            64         EXT     $DNO            NORMALIZE DP ARG                          03 00064
            65         EXT     $EE             ERROR MESSAGE PROCESSOR                   03 00065
            67 *********                                                                   03 00067
            68 * MACRO *                                                                   03 00068
            69 *********                                                                   03 00069
            70 FSE     MAC                                                                03 00070
            71         IFT     VORTEX-2                                               D.103 00071
            72         IFF     VORTEX-4                                               D.103 00072
            73         GOTO    FRMWR1                                                 D.103 00073
            74         EXT     $SE                                                    D.103 00074
            75         CALL    $SE             XFER PARAMETERS                        D.103 00075
            76         GOTO    FRMWR2                                                 D.103 00076
            77 FRMWR1  CONT                                                           D.103 00077
            78         DATA    0105036         BCS XFER PARAMETERS                    D.103 00078
            79 FRMWR2  CONT                                                           D.103 00079
            80         EMAC                                                               03 00080
            83 * DOUBLE PRECISION STORE                                               D.103 00083
            84 FSTD    MAC                                                            D.103 00084
            85         IFT     VORTEX-3                                               D.103 00085
            86         IFF     VORTEX-4                                               D.103 00086
            87         GOTO    FRMWR1                                                 D.103 00087
            88         EXT     $STO                                                   D.103 00088
            89         CALL    $STO            DP STORE                               D.103 00089
            90         GOTO    FRMWR2                                                 D.103 00090
            91 FRMWR1  CONT                                                           D.103 00091
            92         DATA    0105710         FPP DP STORE                           D.103 00092
            93 FRMWR2  CONT                                                           D.103 00093
            94         EMAC                                                           D.103 00094
            97 * DOUBLE PRECISION ADD                                                 D.103 00097
            98 FADD    MAC                                                            D.103 00098
            99         IFT     VORTEX-3                                               D.103 00099
           100         IFF     VORTEX-4                                               D.103 00100
           101         GOTO    FRMWR1                                                 D.103 00101
           102         EXT     $ZK                                                    D.103 00102
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                    103         CALL    $ZK         DP ADD                          D.103 00103
                    104         GOTO    FRMWR2                                      D.103 00104
                    105 FRMWR1  CONT                                                D.103 00105
                    106         DATA    0105503     FPP DP ADD                      D.103 00106
                    107 FRMWR2  CONT                                                D.103 00107
                    108         EMAC                                                D.103 00108
                    111 * DOUBLE PRECISION SUBTRACT                                 D.103 00111
                    112 FSBD    MAC                                                 D.103 00112
                    113         IFT     VORTEX-3                                    D.103 00113
                    114         IFF     VORTEX-4                                    D.103 00114
                    115         GOTO    FRMWR1                                      D.103 00115
                    116         EXT     $ZL                                         D.103 00116
                    117         CALL    $ZL         DP SUBTRACT                     D.103 00117
                    118         GOTO    FRMWR2                                      D.103 00118
                    119 FRMWR1  CONT                                                D.103 00119
                    120         DATA    0105543     FPP DP SUBTRACT                 D.103 00120
                    121 FRMWR2  CONT                                                D.103 00121
                    122         EMAC                                                D.103 00122
                    124 FLT     MAC                                                 E.1*******
                    125         DATA    0105425                                     E.1*******
                    126         DATA    P(1)                                        E.1*******
                    127         EMAC                                                E.1*******
                    130 * DOUBLE PRECISION MULTIPLY                                 D.103 00125
                    131 FMUD    MAC                                                 D.103 00126
                    132         IFT     VORTEX-3                                    D.103 00127
                    133         IFF     VORTEX-4                                    D.103 00128
                    134         GOTO    FRMWR1                                      D.103 00129
                    135         EXT     $ZM                                         D.103 00130
                    136         CALL    $ZM         DP MULTIPLY                     D.103 00131
                    137         GOTO    FRMWR2                                      D.103 00132
                    138 FRMWR1  CONT                                                D.103 00133
                    139         DATA    0105506                                     D.103 00134
                    140 FRMWR2  CONT                                                D.103 00135
                    141         EMAC                                                D.103 00136
                    144 * DOUBLE PRECISION DIVIDE                                   D.103 00139
                    145 FDVD    MAC                                                 D.103 00140
                    146         IFT     VORTEX-3                                    D.103 00141
                    147         IFF     VORTEX-4                                    D.103 00142
                    148         GOTO    FRMWR1                                      D.103 00143
                    149         EXT     $ZN                                         D.103 00144
                    150         CALL    $ZN         DP DIVIDE                       D.103 00145
                    151         GOTO    FRMWR2                                      D.103 00146
                    152 FRMWR1  CONT                                                D.103 00147
                    153         DATA    0105535     FPP DP DIVIDE                   D.103 00148
                    154 FRMWR2  CONT                                                D.103 00149
                    155         EMAC                                                D.103 00150
                    158 *************                                                  03 00153
                    159 * SET BLOCK *                                                  03 00154
                    160 *************                                                  03 00155
        000022 A    161 $BIT    SET     18          PUT LAST FOR 18-BIT                03 00156
        000020 A    162 $BIT    SET     16          PUT LAST FOR 16-BIT                03 00157
                    164 ************************************                           03 00158
                    165 * DLOG IS ENTRY WITH ARG IN CALL SEQ *                         03 00160
                    166 ************************************                           03 00161
000000 074251 A     167 DL      STX     DLSX+1      SAVE X                             03 00162
000001 034014 A     168         LDX     DLP         POINT X AT ARG                     03 00163
000002 074002 A     169         STX     DLOG01                                      V&103 00164
                    170         FLDD                LOAD ARG IN DP ACCUM AC         V&103 00165
000003 002000 A
000004 000000 E
000005              171 DLOG01  BSS     1                                           V&103 00166
                    172         IFT     VORTEX-1                                    V&103 00167
                    173         IFF     VORTEX-2                                    V&103 00168
                    174         GOTO    FRMWR1                                      V&103 00169
                    175         FSTD                                                V&103 00170
                    176         DATA    AC                                          V&103 00171
                    177 FRMWR1  CONT                                                V&103 00172
000006 002000 A     178         CALL    $DLN        GET LOG(AC)                        03 00173
000007 000021 R
000010 034241 A     179         LDX     DLSX+1      RESTORE X                          03 00174
000011 001000 A     180         JMP     0           EXIT                               03 00175
000012 000000 A
000012              181 DLOG    BES     0           ENTRY                              03 00176
                    182         FSE                 XFER PARAMETERS                    03 00177
000013 002000 A
000014 000000 E
000015 000001 A     183         DATA    1                                              03 00178
000016              184 DLP     BSS     1           POINTER TO ARGUMENT                03 00179
000017 001000 A     185         JMP     DL          JUMP BACK FOR FORWARD REF          03 00180
000020 000000 R
                    186 *********************************                              03 00181
                    187 * $DLN IS ENTRY WITH ARG U IN AC *                             03 00182
                    188 *********************************                              03 00183
000021 000000 A     189 $DLN    ENTR                                                   03 00184
000022 054224 A     190         STA     DLSA        SAVE A                             03 00185
000023 064224 A     191         STB     DLSB        SAVE B                             03 00186
000024 074224 A     192         STX     DLSX        SAVE X                             03 00187
                    193         IFT     VORTEX-1                                    D.103 00188
                    194         IFF     VORTEX-2                                    D.103 00189
                    195         GOTO    FRMWR1                                      D.103 00190
                    196         FLDD                                                V&103 00191
                    197         DATA    AC                                          V&103 00192
                    198 FRMWR1  CONT                                                V&103 00193
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                    199          FSTD                STORE U IN DLU                                  V&103 00194
000025 002000 A
000026 000000 E
000027 000257 R     200          DATA     DLU                                                           03 00195
                    201          IFT      VORTEX-3                                                E.1********
                    202          IFF      VORTEX-4                                                E.1********
                    203          GOTO     DFRM1                                                   E.1********
000030 002000 A     204          CALL     $DNO       NORMALIZE U                                        03 00196
000031 000000 E
000032 000257 R     205          DATA     DLU                                                           03 00197
                    206 DFRM1    CONT                                                             E.1********
                    207 **********************                                                        03 00198
                    208 * CHECK RANGE OF U *                                                        03 00199
                    209 **********************                                                        03 00200
000033 014224 A     210          LDA      DLU+1                                                        03 00201
000034 001004 A     211          JAN      DLUN       ERROR IF U ZERO OR NEGATIVE                       03 00202
000035 000216 R
000036 001010 A     212          JAZ      DLUN                                                         03 00203
000037 000216 R
000040 014216 A     213          LDA      DLU        GET BINARY EXPONENT OF U                          03 00204
000041 006140 A     214          SUBI     0400                                                         03 00205
000042 000400 A
000043 001004 A     215          JAN      *+4        GREATER THAN 0377 ?                               03 00206
000044 000047 R
000045 001000 A     216          JMP      DLOV       YES. OVERFLOW                                     03 00207
000046 000213 R
                    217 ********************                                                          03 00208
                    218 * CHECK FOR U=1 *                                                          03 00209
                    219 ********************                                                          03 00210
000047 014210 A     220          LDA      DLU+1      GET WORD 1                                        03 00211
000050 004242 A     221          LRLA     2          CLEAR HIGH BIT OF MANTISSA                        03 00212
000051 004341 A     222          LSRA     1                                                            03 00213
000052 114206 A     223          ORA      DLU+2      OR IN REST OF MANTISSA                            03 00214
000053 114205 A     224          ORA      DLU+3                                                        03 00215
000054 005012 A     225          TAB                                                                   03 00216
000055 014201 A     226          LDA      DLU                                                          03 00217
000056 144161 A     227          SUB      K201       GET EXPONENT                                      03 00218
000057 001030 A     228          JIF      030,DLZE   EXIT IF 1                                         03 00219
000060 000206 R
                    229 ****************************************                                      03 00220
                    230 * FACTOR U=2**N * M  WHERE M=0.1XX... *                                      03 00221
                    231 ****************************************                                      03 00222
000061 014175 A     232          LDA      DLU                                                          03 00223
000062 144155 A     233          SUB      K201       GET N-1                                           03 00224
000063 054160 A     234          STA      DLN+1      SAVE                                              03 00225
                    235          IFT      VORTEX-1                                                E.1********
                    236          IFF      VORTEX-2                                                E.1********
                    237          GOTO     DFRM1                                                   E.1********
                    238          FLT      DLN+1      CREATE N-1/2                                 E.1********
                    239          FADD                                                             E.1********
                    240          DATA     DHALF                                                   E.1********
                    241 DFRM1    CONT                                                             E.1********
000064 014152 A     242          LDA      K200                                                         03 00226
000065 054171 A     243          STA      DLU        DLU NOW HOLDS M                                   03 00227
                    244          IFT      VORTEX-3                                                E.1********
                    245          IFF      VORTEX-4                                                E.1********
                    246          GOTO     DFRM2                                                   E.1********
                    247 ************************                                                      03 00228
                    248 * GET FACTOR (N - 1/2) *                                                     03 00229
                    249 ************************                                                      03 00230
000066 006120 A     250          ADDI     $BIT-1                                                       03 00231
000067 000017 A
000070 054152 A     251          STA      DLN        INITIALIZE EXPONENT                               03 00232
000071 014226 A     252          LDA      DLN8                                                         03 00233
000072 054152 A     253          STA      DLN+2      GET N-1/2                                         03 00234
000073 005001 A     254          TZA                                                                   03 00235
000074 054151 A     255          STA      DLN+3                                                        03 00236
000075 002000 A     256          CALL     $DNO       NORMALIZE FACTOR (N-1/2)                          03 00237
000076 000031 E
000077 000243 R     257          DATA     DLN                                                           03 00238
                    258 ****************************                                                  03 00239
                    259 * GET FACTOR (N-1/2)*LN(2) *                                                 03 00240
                    260 ****************************                                                  03 00241
                    261          FLDD                LOAD (N-1/2) IN AC                           V&103 00242
000100 002000 A
000101 000004 E
000102 000243 R     262          DATA     DLN                                                           03 00243
                    263 DFRM2    CONT                                                             E.1********
                    264          FMUD                MULTIPLY BY LN(2)                            V&103 00244
000103 002000 A
000104 000000 E
000105 000327 R     265          DATA     DLN2                                                          03 00245
                    266          FSTD                STORE PRODUCT IN DLN                         V&103 00246
000106 002000 A
000107 000026 E
000110 000243 R     267          DATA     DLN                                                           03 00247
                    268 ************************************                                          03 00248
                    269 * GET X=(M-1/SQRT(2))/(M+1/SQRT(2)) *                                         03 00249
                    270 ************************************                                          03 00250
                    271          FLDD                LOADM                                        V&103 00251
000111 002000 A
000112 000101 E
000113 000257 R     272          DATA     DLU                                                           03 00252
```

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                        273          FADD                ADD 1/SQRT(2)                                V&103 00253
000114 002000 A
000115 000000 E
000116 000337 R         274          DATA     DLS2                                                        03 00254
                        275          FSTD                SAVE DENOMINATOR                             V&103 00255
000117 002000 A
000120 000107 E
000121 000253 R         276          DATA     DLT                                                         03 00256
                        277          FLDD                LOAD M                                       V&103 00257
000122 002000 A
000123 000112 E
000124 000257 R         278          DATA     DLU                                                         03 00258
                        279          FSBD                SUBTRACT 1/SQRT(2)                           V&103 00259
000125 002000 A
000126 000000 E
000127 000337 R         280          DATA     DLS2                                                        03 00260
                        281          FDVD                                                             V&103 00261
000130 002000 A
000131 000000 E
000132 000253 R         282          DATA     DLT                                                         03 00262
                        283          FSTD                STORE IN X                                   V&103 00263
000133 002000 A
000134 000120 E
000135 000257 R         284          DATA     DLX                                                         03 00264
                        285 **********************                                                       03 00265
                        286 * COMPUTE Z=X**2  *                                                        03 00266
                        287 **********************                                                       03 00267
                        288          IFT      VORTEX-1                                                 D.103 00268
                        289          IFF      VORTEX-2                                                 D.103 00269
                        290          GOTO     FRMWR1                                                   D.103 00270
                        291          FLDD                                                              V&103 00271
                        292          DATA     DLX                                                      V&103 00272
                        293 FRMWR1   CONT                                                              V&103 00273
                        294          FMUD                GET Z=X**2                                   V&103 00274
000136 002000 A
000137 000104 E
000140 000257 R         295          DATA     DLX                                                         03 00275
                        296          FSTD                STORE IN DLZ                                 V&103 00276
000141 002000 A
000142 000134 E
000143 000253 R         297          DATA     DLZ                                                         03 00277
                        298 **********************                                                       03 00278
                        299 * INITIALIZE LOOP *                                                        03 00279
                        300 **********************                                                       03 00280
                        301          FLDD                INITIALIZE SERIES SUM TO C6                  V&103 00281
000144 002000 A
000145 000123 E
000146 000267 R         302          DATA     DLC6                                                        03 00282
                        303          IFT      VORTEX-1                                                 E.1********
                        304          IFF      VORTEX-2                                                 E.1********
                        305          GOTO     DFRM1                                                    E.1********
                        306 * EVALUATE POLY (NO LOOP FOR FPP)                                          E.1********
                        307          FMUD                                                              E.1********
                        308          DATA     DLZ                                                      E.1********
                        309          FADD                                                              E.1********
                        310          DATA     A5                                                       E.1********
                        311          FMUD                                                              E.1********
                        312          DATA     DLZ                                                      E.1********
                        313          FADD                                                              E.1********
                        314          DATA     A4                                                       E.1********
                        315          FMUD                                                              E.1********
                        316          DATA     DLZ                                                      E.1********
                        317          FADD                                                              E.1********
                        318          DATA     A3                                                       E.1********
                        319          FMUD                                                              E.1********
                        320          DATA     DLZ                                                      E.1********
                        321          FADD                                                              E.1********
                        322          DATA     A2                                                       E.1********
                        323          FMUD                                                              E.1********
                        324          DATA     DLZ                                                      E.1********
                        325          FADD                                                              E.1********
                        326          DATA     A1                                                       E.1********
                        327          FMUD                                                              E.1********
                        328          DATA     DLZ                                                      E.1********
                        329          FADD                                                              E.1********
                        330          DATA     A0                                                       E.1********
                        331          GOTO     DFRM2                                                    E.1********
                        332 DFRM1    CONT                                                              E.1********
000147 014072 A         333          LDA      DLM6                                                        03 00283
000150 054070 A         334          STA      DLC                 INITIALIZE LOOP COUNT TO -6             03 00284
000151 006010 A         335          LDAI     DLC6                                                        03 00285
000152 000267 R
000153 054010 A         336          STA      DLPT                INITIALIZE COEFFICIENT POINTER          03 00286
                        337 ***************************************************                          03 00287
                        338 * LOOP TO EVALUATE POLYNOMIAL OF 6TH DEGREE *                               03 00288
                        339 ***************************************************                          03 00289
000154 014007 A         340 DLL      LDA      DLPT                                                        03 00290
000155 124060 A         341          ADD      K4                  BUMP POINTER TO NEXT COEFFICIENT        03 00291
000156 054005 A         342          STA      DLPT                                                        03 00292
                        343          FMUD                         ( )*Z                               V&103 00293
000157 002000 A
000160 000137 E
000161 000253 R         344          DATA     DLZ                                                         03 00294
```

```
                    345          FADD        (CI+( )*Z)                                  V&103 00295
000162 002000 A
000163 000115 E
000164              346 DLPT     BSS         1                                             03 00296
000165 044053 A     347          INR         DLC         BUMP LOOP COUNT                   03 00297
000166 014052 A     348          LDA         DLC                                           03 00298
000167 001004 A     349          JAN         DLL         CHECK FINISH                      03 00299
000170 000154 R
                    350 **********************                                             03 00300
                    351 * GET 2*X*POLYNOMIAL *                                           03 00301
                    352 **********************                                             03 00302
                    353 DFRM2    CONT                                                    E.1********
000171 044065 A     354          INR         DLX         GET 2X IN DLX                     03 00303
                    355          FMUD                    GET LN((1+X)/(1-X)) = 2*X*POLYNOMIAL  V&103 00304
000172 002000 A
000173 000160 E
000174 000257 R     356          DATA        DLX                                           03 00305
                    357 ****************************************                           03 00306
                    358 * LN(U)=(N-1/2)*LN(2) + LN((1+X)/(1-X)) *                         03 00307
                    359 ****************************************                           03 00308
                    360          FADD                                                    V&103 00309
000175 002000 A
000176 000163 E
000177 000243 R     361          DATA        DLN                                           03 00310
000200 007400 A     362 DLXT     ROF         RESET OVFL TO FLAG NO ERRORS                  03 00311
                    363          IFT         VORTEX-1                                    D.103 00312
                    364          IFF         VORTEX-2                                    D.103 00313
                    365          GOTO        FRMWR1                                      D.103 00314
                    366          FSTD                                                    V&103 00315
                    367          DATA        AC                                          V&103 00316
                    368 FRMWR1   CONT                                                    V&103 00317
000201 014045 A     369          LDA         DLSA        RESTORE A                         03 00318
000202 024045 A     370          LDB         DLSB        RESTORE B                         03 00319
000203 034045 A     371          LDX         DLSX        RESTORE X                         03 00320
000204 001000 A     372          JMP*        $DLN                                          03 00321
000205 100021 R
                    373 ************                                                       03 00322
                    374 * LOAD AC=0 *                                                    03 00323
                    375 ************                                                       03 00324
                    376 DLZE     FLDD        AC=0                                        V&103 00325
000206 002000 A
000207 000145 E
000210 000263 R     377          DATA        DLZZ                                          03 00326
000211 001000 A     378          JMP         DLXT        EXIT                              03 00327
000212 000200 R
                    379 ******************                                               03 00328
                    380 * OVERFLOW ERROR *                                             03 00329
                    381 ******************                                               03 00330
000213 005001 A     382 DLOV     TZA                     FLAG AS OVERFLOW                  03 00331
000214 001000 A     383          JMP         *+3                                           03 00332
000215 000217 R
                    384 ********************                                             03 00333
                    385 * UNDERFLOW ERROR *                                           03 00334
                    386 ********************                                             03 00335
000216 005301 A     387 DLUN     DECR        1           FLAG AS UNDERFLOW                 03 00336
000217 054021 A     388          STA         DLC         SAVE FLAG                         03 00337
000220 006010 A     389          LDAI        2                                             03 00338
000221 000002 A
000222 005002 A     390          TZB                                                       03 00339
000223 002000 A     391          CALL        $EE         OUTPUT ERROR MESSAGE 'FUNC ARG'   03 00340
000224 000000 E
000225 014107 A     392          LDA         DLMX+2      GET MAX WORD                      03 00341
000226 134012 A     393          ERA         DLC         SET SIGN                          03 00342
000227 054104 A     394          STA         DLMX+1                                        03 00343
                    395          FLDD                    LOAD MAY SIGNED NUMBER          V&102 00344
000230 002000 A
000231 000207 E
000232 000333 R     396          DATA        DLMX                                          03 00345
000233 007401 A     397          SOF         SET OVFL TO FLAG ERROR                        03 00346
000234 001000 A     398          JMP         DLXT+1                                        03 00347
000235 000201 R
                    399 ****************************                                     03 00348
                    400 * CONSTANTS AND VARIABLES *                                     03 00349
                    401 ****************************                                     03 00350
000236 000004 A     402 K4       DATA        4                                             03 00351
000237 000200 A     403 K200     DATA        0200                                          03 00352
000240 000201 A     404 K201     DATA        0201                                          03 00353
000241              405 DLC      BSS         1           LOOP COUNTER                      03 00354
000242 177772 A     406 DLM6     DATA        -6                                            03 00355
000243              407 DLN      BSS         4           N                                 03 00356
000247              408 DLSA     BSS         1           SAVE A                            03 00357
000250              409 DLSB     BSS         1           SAVE B                            03 00358
000251              410 DLSX     BSS         2           SAVE X                            03 00359
000253              411 DLT      BSS         4           TEMP                              03 00360
000257              412 DLX      BSS         4           SERIES VARIABLE X                 03 00361
        000257 R    413 DLU      EQU         DLX         ARG U                             03 00362
        000253 R    414 DLZ      EQU         DLT         Z=X**2                            03 00363
000263 000000 A     415 DLZZ     DATA        0           DP ZERO                           03 00364
000264 000000 A     416          DATA        0                                             03 00365
000265 000000 A     417          DATA        0                                             03 00366
000266 000000 A     418          DATA        0                                             03 00367
                    419          IFT         $BIT-16                                       03 00368
                    420          GOTO        Z1                                            03 00369
```

```
000267 000175 A  421 DLC6   DATA   0175          16-BIT C6=0.084191 86575 86305
000270 053066 A  422        DATA   053066
000271 031074 A  423        DATA   031074
000272 002705 A  424        DATA   02705
       000273 R  425 A5     EQU    *
000273 000175 A  426        DATA   0175          16-BIT C5=0.090609 35658 17935
000274 056310 A  427        DATA   056310
000275 054576 A  428        DATA   054576
000276 035373 A  429        DATA   035373
       000277 R  430 A4     EQU    *
000277 000175 A  431        DATA   0175          16-BIT C4=0.11111 71831 83715
000300 070710 A  432        DATA   070710
000301 054767 A  433        DATA   054767
000302 046066 A  434        DATA   046066
       000303 R  435 A3     EQU    *
000303 000176 A  436        DATA   0176          16-BIT C3=0.14285 70799 46083
000304 044444 A  437        DATA   044444
000305 044026 A  438        DATA   044026
000306 027554 A  439        DATA   027554
       000307 R  440 A2     EQU    *
000307 000176 A  441        DATA   0176          16-BIT C2=0.20000 00003 09803
000310 063146 A  442        DATA   063146
000311 031464 A  443        DATA   031464
000312 041753 A  444        DATA   041753
       000313 R  445 A1     EQU    *                                          E.1********
000313 000177 A  446        DATA   0177          16-BIT C1=0.33333 33333 32762
000314 052525 A  447        DATA   052525
000315 025252 A  448        DATA   025252
000316 052455 A  449        DATA   052455
       000317 R  450 A0     EQU    *                                          E.1********
000317 000201 A  451        DATA   0201          16-BIT C0=1.0000 00000 00000
000320 040000 A  452 DLHB   DATA   040000
000321 000000 A  453        DATA   0
000322 000000 A  454        DATA   0
000323 000200 A  455 DHALF  DATA   0200,040000,0,0                            E.1********
000324 040000 A
000325 000000 A
000326 000000 A
000327 000200 A  456 DLN2   DATA   0200          16-BIT LN(2)=0.6931 47180 55994 53
000330 054271 A  457        DATA   054271
000331 002775 A  458        DATA   02775
000332 075073 A  459        DATA   075073
000333 000377 A  460 DLMX   DATA   0377          16-BIT MAX + NUMBER
000334 077777 A  461        DATA   077777
000335 077777 A  462        DATA   077777
000336 077777 A  463        DATA   077777
000337 000200 A  464 DLS2   DATA   0200          16-BIT 1/SQRT(2) = 0.70710 67811 86547 5
000340 055202 A  465        DATA   055202
000341 036314 A  466        DATA   036314
000342 077473 A  467        DATA   077473
                 468 Z1     CONT
                 469        IFT    $BIT-18
                 470        GOTO   Z2
                 471 DLC6   DATA   0175          18-BIT C6=0.084191 86575 86305 3
                 472        DATA   0251331
                 473        DATA   0261700
                 474        DATA   0270515
                 475        DATA   0175          18-BIT C5=0.090609 35658 17935 4
                 476        DATA   0271442
                 477        DATA   0213747
                 478        DATA   0137367
                 479        DATA   0175          18-BIT C4=0.11111 71831 83715 4
                 480        DATA   0343442
                 481        DATA   0317571
                 482        DATA   0206600
                 483        DATA   0176          18-BIT C3=0.14285 70799 46082 7
                 484        DATA   0222222
                 485        DATA   0100545
                 486        DATA   0255376
                 487        DATA   0176          18-BIT C2=0.20000 00003 09807 8
                 488        DATA   0314631
                 489        DATA   0231510
                 490        DATA   0175312
                 491        DATA   0177          18-BIT C1=0.33333 33333 32761 8
                 492        DATA   0252525
                 493        DATA   0125252
                 494        DATA   0245507
                 495        DATA   0201          18-BIT C0=1.0000 00000 00000 0
                 496 DLHB   DATA   0200000
                 497        DATA   0
                 498        DATA   0
                 499 DLMX   DATA   0377          18-BIT MAX + NUMBER
                 500        DATA   0377777
                 501        DATA   0377777
                 502        DATA   0377777
                 503 DLN2   DATA   0200          18-BIT LN(2)=0.6931 47180 55994 53
                 504        DATA   0261344
                 505        DATA   057737
                 506        DATA   0107173
                 507 DLS2   DATA   0200          18-BIT 1/SQRT(2) = 0.70710 67811 86547 5
                 508        DATA   0265011
                 509        DATA   0346317
                 510        DATA   0347363
```

```
                511 Z2      CONT                                                    03 00453
                512         END                                                     03 00454
ENTRY NAMES
000021 R $DLN    000012 R DLOG
EXTERNAL NAMES
000231 E $DLO    000076 E $DNO    000224 E $EE     000014 E $SE
000142 E $STO    000176 E $ZK     000126 E $ZL     000173 E $ZM
000131 E $ZN     000000 E AC
SYMBOLS
000020 A $BIT    000021 R $DLN    000231 E $DLO    000076 E $DNO
000224 E $EE     000014 E $SE     000142 E $STO    000176 E $ZK
000126 E $ZL     000173 E $ZM     000131 E $ZN     000317 R A0
000313 R A1      000307 R A2      000303 R A3      000277 R A4
000273 R A5      000000 E AC      000323 R DHALF   000000 R DL
000241 R DLC     000267 R DLC6    000320 R DLHB    000154 R DLL
000242 R DLM6    000333 R DLMX    000243 R DLN     000327 R DLN2
000012 R DLOG    000005 R DLOG01  000213 R DLOV    000016 R DLP
000164 R DLPT    000337 R DLS2    000247 R DLSA    000250 R DLSB
000251 R DLSX    000253 R DLT     000257 R DLU     000216 R DLUN
000257 R DLX     000200 R DLXT    000253 R DLZ     000206 R DLZE
000263 R DLZZ    000237 R K200    000240 R K201    000236 R K4
000001 A VORTEX
  0 ERRORS ASSEMBLY COMPLETE


  161   $BIT       250    419    469
  189   $DLN        43    178    372
    0   $DLO        55     56
    0   $DNO        64    204    256
    0   $EE         65    391
    0   $SE         74     75
    0   $STO        88     89
    0   $ZK        102    103
    0   $ZL        116    117
    0   $ZM        135    136
    0   $ZN        149    150
  450   A0         330
  445   A1         326
  440   A2         322
  435   A3         318
  430   A4         314
  425   A5         310
    0   AC          62    176    197    367
  206   DFRM1      203    237    305
  263   DFRM2      246    331
  455   DHALF      240
  167   DL         185
  405   DLC        334    347    348    388    393
  421   DLC6       302    335
  452   DLHB       252
  340   DLL        349
  406   DLM6       333
  460   DLMX       392    394    396
  407   DLN        234    238    251    253    255    257    262    267    361
  456   DLN2       265
  181   DLOG        11     44
  171   DLOG01     169
  382   DLOV       216
  184   DLP        168
  346   DLPT       336    340    342
  464   DLS2       274    280
  408   DLSA       190    369
  409   DLSB       191    370
  410   DLSX       167    179    192    371
  411   DLT        276    282    414
  413   DLU        200    205    210    213    220    223    224    226    232
                   243    272    278
  387   DLUN       211    212

  412   DLX        284    292    295    354    356    413
  362   DLXT       378    398
  414   DLZ        297    308    312    316    320    324    328    344
  376   DLZE       228
  415   DLZZ       377
   58   FRMWR1      54     73     87    101    115    134    148    174    195
                   290    365
   60   FRMWR2      57     76     90    104    118    137    151
  403   K200       242
  404   K201       227    233
  402   K4         341
    0   P          126
    1   VORTEX      52     53     71     72     85     86     99    100    113
                   114    132    133    146    147    172    173    193    194
                   201    202    235    236    244    245    288    289    303
                   304    363    364
  468   Z1         420
  511   Z2         470
```

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```
000001 A      1 VORTEX SET     1                                                                07 00001
              2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE        07 00002
              3 *                                                                              07 00003
              4 *   V.D.M.  PART  NO.        92L0506-122D                                      07 00004
              5 *                                                                              07 00005
              6 *                                    RELEASE     10-15-73                      07 00006
              7 *                                                                              07 00007
              8 *              ALOG                                                            07 00008
              9 *                                                                              07 00009
             10 *                                                                              07 00010
             11         TITLE   ALOG                                                          07 00011
             12 ***************************************************************************** 07 00012
             13 *                                                                           *  07 00013
             14 *            R E A L   L O G   T O   B A S E   E ( A L O G )                 *  07 00014
             15 *                                                                           *  07 00015
             16 * FUNCTION: TO COMPUTE LOG(R) TO BASE E, WHERE R AND RESULT ARE             *  07 00016
             17 *           REAL NUMBERS. THE METHOD IS TO FACTOR R INTO A PRODUCT           *  07 00017
             18 *           OF POWERS OF 2 AND A REMAINDER TERM. THE LOGS OF THE             *  07 00018
             19 *           POWERS OF 2 IN R ARE TKEN FROM A TABLE, THE LOG OF THE           *  07 00019
             20 *           REMAINDER IS COMPUTED BY A FIXED-POINT POLYNOMIAL. THE           *  07 00020
             21 *           LOG OF R IS THE SUM OF ALL THESE.                                *  07 00021
             22 *                                                                           *  07 00022
             23 * ENTRY: NO SPECIAL CONDITIONS                                             *  07 00023
             24 *                                                                           *  07 00024
             25 * CALLING SEQUENCE: JMPM ALOG                                             *  07 00025
             26 *                    DATA ADDRESS OF ARGUMENT                               *  07 00026
             27 *                                                                           *  07 00027
             28 * EXIT : REAL RESULT IN AB                                                 *  07 00028
             29 *                                                                           *  07 00029
             30 * ERRORS: IF INVALID ARGUMENT:                                             *  07 00030
             31 *           'FUNC ARG' MESSAGE OUTPUT                                       *  07 00031
             32 *           AB=0                                                            *  07 00032
             33 *           OVFL SET                                                        *  07 00033
             34 *                                                                           *  07 00034
             35 ***************************************************************************** 07 00035
             37 ***********                                                                  07 00037
             38 * ENTRIES *                                                                  07 00038
             39 ***********                                                                  07 00039
             40         NAME    ALOG                                                        07 00040
             42 ************                                                                 07 00042
             43 * EXTERNALS *                                                               07 00043
             44 ************                                                                 07 00044
             45         EXT     $EE             ERROR MESSAGE PROCESSOR                     07 00045
             46         EXT     $NML            REAL NORMALIZE                              07 00046
             47         EXT     $FC             FLOAT INTEGER                               07 00047
             49 *********                                                                    07 00049
             50 * MACRO *                                                                    07 00050
             51 *********                                                                    07 00051
             52 FAD     MAC                                                                 07 00052
             53         IFT     VORTEX-3                                                D.107 00053
             54         IFF     VORTEX-4                                                D.107 00054
             55         GOTO    FRMWR2                                                  D.107 00055
             56         IFT     VORTEX-1                                                D.107 00056
             57         GOTO    FRMWR1                                                  D.107 00057
             58         EXT     $QK             REAL ADD                                D.107 00058
             59         CALL    $QK                                                     D.107 00059
             60         GOTO    FRMWR3                                                  D.107 00060
             61 FRMWR1  CONT                                                            D.107 00061
             62         DATA    0105134         BCS REAL ADD                            D.107 00062
             63         GOTO    FRMWR3                                                  D.107 00063
             64 FRMWR2  CONT                                                            D.107 00064
             65         DATA    0105410         FPP REAL ADD                            D.107 00065
             66 FRMWR3  CONT                                                            D.107 00066
             67         EMAC                                                              07 00067
             69 *********                                                                D.107 00069
             70 * MACRO *                                                                D.107 00070
             71 *********                                                                D.107 00071
             72 FLD     MAC                                                             D.107 00072
             73         DATA    0105420         FPP LOAD                                D.107 00073
             74         DATA    P(1)                                                    D.107 00074
             75         EMAC                                                            D.107 00075
             79 *********                                                                D.107 00079
             80 * MACRO *                                                                D.107 00080
             81 *********                                                                D.107 00081
             82 FST     MAC                                                             D.107 00082
             83         DATA    0105600         FPP STORE                               D.107 00083
             84         DATA    P(1)                                                    D.107 00084
             85         EMAC                                                            D.107 00085
             88 *********                                                                  07 00088
             89 * MACRO *                                                                  07 00089
             90 *********                                                                  07 00090
             91 FSB     MAC                                                               07 00091
             92         IFT     VORTEX-3                                                D.107 00092
             93         IFF     VORTEX-4                                                D.107 00093
             94         GOTO    FRMWR2                                                  D.107 00094
             95         IFT     VORTEX-1                                                D.107 00095
             96         GOTO    FRMWR1                                                  D.107 00096
             97         EXT     $QL             REAL SUBTRACT                           D.107 00097
             98         CALL    $QL                                                     D.107 00098
             99         GOTO    FRMWR3                                                  D.107 00099
            100 FRMWR1  CONT                                                            D.107 00100
            101         DATA    0105174         BCS REAL SUBTRACT                       D.107 00101
            102         GOTO    FRMWR3                                                  D.107 00102
```

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                103 FRMWR2  CONT
                104         DATA    0105450         FPP REAL SUBTRACT
                105 FRMWR3  CONT
                106         EMAC
                107 * FIX REAL TO FIXED
                108 FIX     MAC
                109         DATA    0105621
                110         DATA    P(1)
                111         EMAC
                115 * FLOAT FIXED TO REAL
                116 FLT     MAC
                117         DATA    0105425
                118         DATA    P(1)
                119         EMAC
                122 *********
                123 * MACRO *
                124 *********
                125 FMU     MAC
                126         IFT     VORTEX-3
                127         IFF     VORTEX-4
                128         GOTO    FRMWR2
                129         IFT     VORTEX-1
                130         GOTO    FRMWR1
                131         EXT     $SM             REAL MULTIPLY
                132         CALL    $SM
                133         GOTO    FRMWR3
                134 FRMWR1  CONT
                135         DATA    0105074         BCS REAL MULTIPLY
                136         GOTO    FRMWR3
                137 FRMWR2  CONT
                138         DATA    0105416         FPP REAL MULTIPLY
                139 FRMWR3  CONT
                140         EMAC
                143 *********
                144 * MACRO *
                145 *********
                146 FDV     MAC
                147         IFT     VORTEX-3
                148         IFF     VORTEX-4
                149         GOTO    FRMWR2
                150         IFT     VORTEX-1
                151         GOTO    FRMWR1
                152         EXT     $DN             REAL DIVIDE
                153         CALL    $DN
                154         GOTO    FRMWR3
                155 FRMWR1  CONT
                156         DATA    0105034         BCS REAL DIVIDE
                157         GOTO    FRMWR3
                158 FRMWR2  CONT
                159         DATA    0105401         FPP REAL DIVIDE
                160 FRMWR3  CONT
                161         EMAC
                164 FSE     MAC
                165         IFT     VORTEX-1
                166         GOTO    SOFT1
                167         EXT     $TS
                168         CALL    $TS
                169         GOTO    FRMWR2
                170 SOFT1   CONT
                171         IFT     VORTEX-2
                172         IFF     VORTEX-4
                173         GOTO    FRMWR1
                174         STX     P+2             SAVE X
                175         LDAE    P,1)
                176         TAX
                177         INX
                178         STA     P(2)            SET RETURN ADDR
                179         LDA     0,1             FETCH ADDR OF ARGUMENT
                180         TAX
                181         JPN     *-2
                182         GOTO    FRMWR2
                183 FRMWR1  CONT
                184         DATA    0105036         BCS XFER PARAMETERS
                185         IFT     VORTEX-4
                186         GOTO    FRMWR2
                187         DATA    1
                188         DATA    1
                189         STX     P(2)            SAVE X
                190         LDXE    P,1)
                191         STX     P(2)
                192         LDA     *-5             FETCH ADDR OF ARG
                193 FRMWR2  CONT
                194         EMAC
                195         IFT     VORTEX-3
                196         IFF     VORTEX-4
                197         GOTO    NEWLOG
                200 *********
                201 * MACRO *
                202 *********
                203 XAD     MAC
                204         IFF     VORTEX-1
                205         EXT     XDAD            FIXED-POINT ADD
                206         IFF     VORTEX-1
```

```
                    207          CALL     XDAD                                                    07 00207
                    208          IFT      VORTEX-1                                                07 00208
                    209          DATA     0105334       BCS FIXED-POINT ADD                       07 00209
                    210          EMAC                                                             07 00210
                    213 **********                                                                07 00213
                    214 * MACRO *                                                                 07 00214
                    215 **********                                                                07 00215
                    216 XSB      MAC                                                              07 00216
                    217          IFF      VORTEX-1                                                07 00217
                    218          EXT      XDSU          FIXED-POINT SUBTRACT                      07 00218
                    219          IFF      VORTEX-1                                                07 00219
                    220          CALL     XDSU                                                    07 00220
                    221          IFT      VORTEX-1                                                07 00221
                    222          DATA     0105374       BCS FIXED-POINT SUBTRACT                  07 00222
                    223          EMAC                                                             07 00223
                    226 **********                                                                07 00226
                    227 * MACRO *                                                                 07 00227
                    228 **********                                                                07 00228
                    229 XMU      MAC                                                              07 00229
                    230          IFF      VORTEX-1                                                07 00230
                    231          EXT      XDMU          FIXED-POINT MULTIPLY                      07 00231
                    232          IFF      VORTEX-1                                                07 00232
                    233          CALL     XDMU                                                    07 00233
                    234          IFT      VORTEX-1                                                07 00234
                    235          DATA     0105274       BCS FIXED-POINT MULTIPLY                  07 00235
                    236          EMAC                                                             07 00236
                    239 *********                                                                 07 00239
                    240 * MACRO *                                                                 07 00240
                    241 *********                                                                 07 00241
                    242 XDV      MAC                                                              07 00242
                    243          IFF      VORTEX-1      FIXED-POINT DIVIDE                        07 00243
                    244          EXT      XDDI                                                    07 00244
                    245          IFF      VORTEX-1                                                07 00245
                    246          CALL     XDDI                                                    07 00246
                    247          IFT      VORTEX-1                                                07 00247
                    248          DATA     0105234       BCS FIXED-POINT DIVIDE                    07 00248
                    249          EMAC                                                             07 00249
                    252 ************                                                              07 00252
                    253 * SET BLOCK *                                                            07 00253
                    254 ************                                                              07 00254
         000022 A   255 $BIT     SET      18                                                      07 00255
         000020 A   256 $BIT     SET      16                                                      07 00256
         000001 A   257 X        SET      1                                                       07 00257
000000   074213 A   259 LN       STX      LNSX          SAVE X                                    07 00259
000001   005001 A   260          TZA                                                              07 00260
000002   054214 A   261          STA      LNV           CLEAR RESULT TO ZERO                      07 00261
000003   054214 A   262          STA      LNV+1                                                   07 00262
                    263 ******************************                                            07 00263
                    264 * GET ARGUMENT U, CHECK RANGE *                                          07 00264
                    265 ******************************                                            07 00265
000004   034164 A   266          LDX      LNP           POINT X AT ARGUMENT U                     07 00266
000005   015000 A   267          LDA      0,X           LOAD U IN AB                              07 00267
000006   025001 A   268          LDB      1,X                                                     07 00268
000007   001004 A   269          JAN      LNER          ERROR ON NEG ARG                          07 00269
000010   000174 R
000011   001010 A   270          JAZ      LNER          ERROR ON ZERO ARG                         07 00270
000012   000174 R
                    271 ************************************                                      07 00271
                    272 * FACTOR U=2**N * Y   WHERE Y=1.XX *                                     07 00272
                    273 ************************************                                      07 00273
000013   054175 A   274          STA      LNA           SAVE HIGH WORD OF U                       07 00274
000014   154207 A   275          ANA      LNEM          GET EXPONENT FIELD                        07 00275
000015   054175 A   276          STA      LNE           SAVE IN LNE                               07 00276
000016   134172 A   277          ERA      LNA           RESTORE HIGH WORD OF MANTISSA             07 00277
000017   114201 A   278          ORA      LNE1          MERGE EXPONENT                            07 00278
000020   054170 A   279          STA      LNA           SAVE Y IN LNA                             07 00279
000021   064170 A   280          STB      LNA+1                                                   07 00280
000022   014170 A   281          LDA      LNE           RESTORE EXPONENT                          07 00281
000023   004347 A   282          LSRA     $BIT-9        RIGHT-ADJUST                              07 00282
000024   006140 A   283          SUBI     0201          SUBTRACT BIAS TO GET N                    07 00283
000025   000201 A
000026   001010 A   284          JAZ      LN1           SKIP NEXT BLOCK IF N=0                    07 00284
000027   000037 R
                    285 ************************                                                  07 00285
                    286 * LN(U)=N*LN(2) + LN(Y) *                                               07 00286
                    287 * COMPUTE N*LN(2)       *                                               07 00287
                    288 ************************                                                  07 00288
000030   002000 A   289          CALL     $PC           FLOAT N                                   07 00289
000031   000000 E
                    290          FMU                     GET N*LN(2)                             07 00290
000032   002000 A
000033   000000 E
000034   000222 R   291          DATA     LN2E                                                    07 00291
000035   054161 A   292          STA      LNV           SAVE IN LNV                               07 00292
000036   064161 A   293          STB      LNV+1                                                   07 00293
                    294 ************************                                                  07 00294
                    295 * INITIALIZE FACTOR LOOP *                                             07 00295
                    296 ************************                                                  07 00296
000037   006010 A   297 LN1      LDAI     LNT1-2                                                  07 00297
000040   000225 R
000041   054035 A   298          STA      LNP1          INITIALIZE TABLE 1 POINTER                07 00298
000042   006120 A   299          ADDI     LNT2-LNT1                                               07 00299
000043   000016 A
```

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000044 054041 A   300          STA     LNP2            INITIALIZE TABLE 2 POINTER                    07 00300
                  301 **********************************                                            07 00301
                  302 * LOOP TO FACTOR OUT POWERS OF 2 *                                            07 00302
                  303 **********************************                                            07 00303
000045 044031 A   304 LNLP     INR     LNP1            BUMP TABLE POINTERS                           07 00304
000046 044030 A   305          INR     LNP1                                                          07 00305
000047 044036 A   306          INR     LNP2                                                          07 00306
000050 044035 A   307          INR     LNP2                                                          07 00307
000051 014025 A   308          LDA     LNP1                                                          07 00308
000052 006140 A   309          SUBI    LNT2                                                          07 00309
000053 000245 R
000054 001010 A   310          JAZ     LNI             EXIT AT END OF TABLE                          07 00310
000055 000113 R
000056 034020 A   311          LDX     LNP1            POINT X AT TABLE 1 ENTRY                      07 00311
000057 014131 A   312          LDA     LNA                                                           07 00312
000060 145000 A   313          SUB     0,X             COMPARE HIGH WORDS                            07 00313
000061 001004 A   314          JAN     LNLP            LOOP BACK IF TABLE 1 ENTRY.GT.Y               07 00314
000062 000045 R
                  315          IFT     $BIT-16                                                       07 00315
                  316          GOTO    1                                                             07 00316
000063 001010 A   317          JAZ     *+4                                                           07 00317
000064 000067 R
000065 001000 A   318          JMP     LNF                                                           07 00318
000066 000073 R
000067 014122 A   319          LDA     LNA+1                                                         07 00319
000070 145001 A   320          SUB     1,X             MUST TEST LOW WORDS FOR 16 BIT                07 00320
000071 001004 A   321          JAN     LNLP                                                          07 00321
000072 000045 R
                  322 1        CONT                                                                  07 00322
                  323 **********************************************                                07 00323
                  324 * Y.GE.TABLE   FACTOR TABLE ENTRY OUT OF Y *                                   07 00324
                  325 **********************************************                                07 00325
000073 014115 A   326 LNF      LDA     LNA                                                           07 00326
000074 024115 A   327          LDB     LNA+1                                                         07 00327
                  328          FDV                      AB=Y/(TABLE 1 ENTRY)                         07 00328
000075 002000 A
000076 000000 E
000077            329 LNP1     BSS     1                                                             07 00329
000100 054110 A   330          STA     LNA             SET Y=AB                                      07 00330
000101 064110 A   331          STB     LNA+1                                                         07 00331
000102 014114 A   332          LDA     LNV                                                           07 00332
000103 024114 A   333          LDB     LNV+1                                                         07 00333
                  334          FAD                      AB=LN(PREVIOUS) + LN(TABLE 1 ENTRY)          07 00334
000104 002000 A
000105 000000 E
000106            335 LNP2     BSS     1                                                             07 00335
000107 054107 A   336          STA     LNV             SET VALUE=AB                                  07 00336
000110 064107 A   337          STB     LNV+1                                                         07 00337
000111 001000 A   338          JMP     LNLP            CONTINUE LOOP                                 07 00338
000112 000045 R
                  339 ************************************************************                  07 00339
                  340 * APPROXIMATE REST OF INTERVAL BY FIXED-POINT POLYNOMIAL *                     07 00340
                  341 ************************************************************                  07 00341
000113 014076 A   342 LNI      LDA     LNA+1                                                         07 00342
000114 005002 A   343          TZB                                                                   07 00343
000115 001010 A   344          JAZ     LNW             FINISHED IF LOW WORD OF Y = 0                 07 00344
000116 000205 R
000117 054071 A   345          STA     LNA                                                           07 00345
000120 064071 A   346          STB     LNA+1           SAVE Y                                        07 00346
                  347 ***************************************                                       07 00347
                  348 * APPROXIMATE BY FIXED-POINT POLYNOMIAL *                                     07 00348
                  349 ***************************************                                       07 00349
000121 004501 A   350          LSR     1               SHIFT TO PREVENT DIVIDE OVERFLOW              07 00350
                  351          XDV                      GET Y/3                                      07 00351
000122 002000 A
000123 000000 E
000124 000226 R   352          DATA    LNK3                                                          07 00352
000125 004511 A   353          LSR     $BIT-7          ADJUST                                        07 00353
000126 054066 A   354          STA     LNT             SAVE                                          07 00354
000127 064066 A   355          STB     LNT+1                                                         07 00355
000130 014074 A   356          LDA     LNK1            GET 1/2                                       07 00356
000131 005002 A   357          TZB                                                                   07 00357
                  358          XSB                      GET (1/2-Y/3)                                07 00358
000132 002000 A
000133 000000 E
000134 000215 R   359          DATA    LNT                                                           07 00359
                  360          XMU                      GET (1/2-Y/3)*Y                              07 00360
000135 002000 A
000136 000000 E
000137 000211 R   361          DATA    LNA                                                           07 00361
000140 004507 A   362          LSR     $BIT-9          ADJUST                                        07 00362
000141 054053 A   363          STA     LNT             SAVE                                          07 00363
000142 054053 A   364          STA     LNT+1                                                         07 00364
000143 014061 A   365          LDA     LNK1            GET 1                                         07 00365
000144 005002 A   366          TZB                                                                   07 00366
                  367          XSB                      GET (1-(1/2-Y/3)*Y)                          07 00367
000145 002000 A
000146 000133 E
000147 000215 R   368          DATA    LNT                                                           07 00368
                  369          XMU                      GET (1-(1/2-Y/3)*Y)*Y                        07 00369
000150 002000 A
000151 000136 E
000152 000211 R   370          DATA    LNA                                                           07 00370
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000153 004506 A  371          LASR    $BIT-10       ADJUST                                  07 00371
000154 002000 A  372          CALL    $NML          NORMALIZE                               07 00372
000155 000000 E
000156 124042 A  373          ADD     LNE1          CONVERT TO FLOATING POINT               07 00373
                 374          FAD                    ADD TO PREVIOUS VALUE                  07 00374
000157 002000 A
000160 000105 E
000161 000217 R  375          DATA    LNV                                                   07 00375
                 376 ********                                                              07 00376
                 377 * EXIT *                                                              07 00377
                 378 ********                                                              07 00378
000162 007400 A  379 LNZ      ROF                   RESET OVFL TO FLAG NO ERROR             07 00379
000163 034030 A  380          LDX     LNSX          RESTORE X                               07 00380
000164 001000 A  381          JMP     0             EXIT                                    07 00381
000165 000000 A
000165           382 ALOG     BES     0             ENTRY                                   07 00382
                 383          FSE                   XFER PARAMETERS                         07 00383
000166 002000 A
000167 000000 E
000170 000001 A  384          DATA    1                                                     07 00384
000171           385 LNP      BSS     1             POINTER TO ARGUMENT                     07 00385
000172 001000 A  386          JMP     LN            JUMP BACK FOR FORWARD REF               07 00386
000173 000000 R
                 387 *********                                                             07 00387
                 388 * ERROR *                                                             07 00388
                 389 *********                                                             07 00389
000174 005002 A  390 LNER     TZB                   SET B=0 TO RETURN                       07 00390
000175 006010 A  391          LDAI    2                                                     07 00391
000176 000002 A
000177 002000 A  392          CALL    $EE           OUTPUT 'FUNC ARG'                       07 00392
000200 000000 E
000201 005003 A  393          ZERO    3             SET AB=0                                07 00393
000202 007401 A  394          SOF                   SET OVFL TO FLAG ERROR                  07 00394
000203 001000 A  395          JMP     LNZ+1         EXIT                                    07 00395
000204 000163 R
                 396 **************                                                        07 00396
                 397 * LOAD VALUE *                                                       07 00397
                 398 **************                                                        07 00398
000205 014011 A  399 LNW      LDA     LNV           LOAD AB WITH VALUE                      07 00399
000206 024011 A  400          LDB     LNV+1                                                 07 00400
000207 001000 A  401          JMP     LNZ           EXIT                                    07 00401
000210 000162 R
                 402 ****************************                                          07 00402
                 403 * CONSTANTS AND VARIABLES *                                          07 00403
                 404 ****************************                                          07 00404
000211           405 LNA      BSS     2             ARGUMENT                                07 00405
000213           406 LNE      BSS     1             EXPONENT                                07 00406
000214           407 LNSX     BSS     1             SAVE X                                  07 00407
000215           408 LNT      BSS     2             TEMP STORE                              07 00408
000217           409 LNV      BSS     2             LN(U)                                   07 00409
                 410          IFT     $BIT-16                                               07 00410
                 411          GOTO    4                                                     07 00411
000221 040200 A  412 LNE1     DATA    040200        16-BIT EXP=1                            07 00412
000222 040130 A  413 LN2E     DATA    040130        LN(2)                                   07 00413
000223 056206 A  414          DATA    056206                                                07 00414
000224 077600 A  415 LNEM     DATA    077600        16-BIT EXPONENT MASK                    07 00415
000225 040000 A  416 LNK1     DATA    040000        16-BIT FIXED-POINT 1                    07 00416
000226 060000 A  417 LNK3     DATA    060000        16-BIT FIXED-POINT 3                    07 00417
                 418 ********************************                                      07 00418
                 419 * TABLE OF FACTORS 1.0..010.. *                                      07 00419
                 420 ********************************                                      07 00420
000227 040340 A  421 LNT1     DATA    040340        1.1                                     07 00421
000230 000000 A  422          DATA    0                                                     07 00422
000231 040320 A  423          DATA    040320        1.01                                    07 00423
000232 000000 A  424          DATA    0                                                     07 00424
000233 040310 A  425          DATA    040310        1.001                                   07 00425
000234 000000 A  426          DATA    0                                                     07 00426
000235 040304 A  427          DATA    040304        1.0001                                  07 00427
000236 000000 A  428          DATA    0                                                     07 00428
000237 040302 A  429          DATA    040302        1.00001                                 07 00429
000240 000000 A  430          DATA    0                                                     07 00430
000241 040301 A  431          DATA    040301        1.000001                                07 00431
000242 000000 A  432          DATA    0                                                     07 00432
000243 040300 A  433          DATA    040300        1.0000001                               07 00433
000244 040000 A  434          DATA    040000                                                07 00434
                 435 ********************************                                      07 00435
                 436 * TABLE OF LOGS OF FACTORS *                                         07 00436
                 437 ********************************                                      07 00437
000245 037747 A  438 LNT2     DATA    037747        LN(1.1)                                 07 00438
000246 063110 A  439          DATA    063110                                                07 00439
000247 037562 A  440          DATA    037562        LN(1.01)                                07 00440
000250 017760 A  441          DATA    017760                                                07 00441
000251 037370 A  442          DATA    037370        LN(1.001)                               07 00442
000252 047017 A  443          DATA    047017                                                07 00443
000253 037174 A  444          DATA    037174        LN(1.0001)                              07 00444
000254 012141 A  445          DATA    012141                                                07 00445
000255 036776 A  446          DATA    036776        LN(1.00001)                             07 00446
000256 002466 A  447          DATA    02466                                                 07 00447
000257 036577 A  448          DATA    036577        LN(1.000001)                            07 00448
000260 000521 A  449          DATA    0521                                                  07 00449
000261 036377 A  450          DATA    036377        LN(1.0000001)                           07 00450
000262 040125 A  451          DATA    040125                                                07 00451
                 452 4        CONT                                                        07 00452
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                453          IFT     $BIT-18                                                    07 00453
                454          GOTO    5                                                          07 00454
                455 LNE1     DATA    0201000         18-BIT EXP=1                               07 00455
                456 LN2E     DATA    0200542         LN(2)                                      07 00456
                457          DATA    0344140                                                    07 00457
                458 LNEM     DATA    0377000         18-BIT EXPONENT MASK                       07 00458
                459 LNK1     DATA    0200000         18-BIT FIXED-POINT 1                       07 00459
                460 LNK3     DATA    0300000         18-BIT FIXED-POINT 3                       07 00460
                461 ********************************                                           07 00461
                462 * TABLE OF FACTORS 1.0..010.. *                                           07 00462
                463 ********************************                                           07 00463
                464 LNT1     DATA    0201600         1.1                                        07 00464
                465          DATA    0                                                          07 00465
                466          DATA    0201500         1.01                                       07 00466
                467          DATA    0                                                          07 00467
                468          DATA    0201440         1.001                                      07 00468
                469          DATA    0                                                          07 00469
                470          DATA    0201420         1.0001                                     07 00470
                471          DATA    0                                                          07 00471
                472          DATA    0201410         1.00001                                    07 00472
                473          DATA    0                                                          07 00473
                474          DATA    0201404         1.000001                                   07 00474
                475          DATA    0                                                          07 00475
                476          DATA    0201402         1.0000001                                  07 00476
                477          DATA    0                                                          07 00477
                478          DATA    0201401         1.00000001                                 07 00478
                479          DATA    0                                                          07 00479
                480 ****************************                                               07 00480
                481 * TABLE OF LOGS OF FACTORS *                                               07 00481
                482 ****************************                                               07 00482
                483 LNT2     DATA    0177637         LN(1.1)                                    07 00483
                484          DATA    062176                                                     07 00484
                485          DATA    0176710         LN(1.01)                                   07 00485
                486          DATA    0377371                                                    07 00486
                487          DATA    0175742         LN(1.001)                                  07 00487
                488          DATA    0160356                                                    07 00488
                489          DATA    0174760         LN(1.0001)                                 07 00489
                490          DATA    0243030                                                    07 00490
                491          DATA    0173770         LN(1.00001)                                07 00491
                492          DATA    051542                                                     07 00492
                493          DATA    0172774         LN(1.000001)                               07 00493
                494          DATA    012426                                                     07 00494
                495          DATA    0171776         LN(1.0000001)                              07 00495
                496          DATA    02515                                                      07 00496
                497          DATA    0170777         LN(1.00000001)                             07 00497
                498          DATA    0526                                                       07 00498
                499 5        CONT                                                               07 00499
                500          GOTO    LOGEND                                                  D.107 00500
                501 NEWLOG   CONT                                                            D.107 00501
                502 ************************************************************            D.107 00502
                503 * COMPUTES NATURAL LOG OF A FLOATING POINT NO.            *             D.107 00503
                504 * PERFORMS THREE SUMS A(2K+1)*U**(2K+1) WHERE K FROM     *             D.107 00504
                505 * 0 TO 2. U=(X-V2/2)/(X+V2/2). WHEN 1/2<=X<1,            *             D.107 00505
                506 * LNX=-1/2LN2+SUM DESCRIBED ABOVE. FINALLY, ADD          *             D.107 00506
                507 * EXP*LN2. ACCURACY ESTIMATED AT 3X10**-8.               *             D.107 00507
                508 ************************************************************            D.107 00508
                509 **************                                                           D.107 00509
                510 * ALOG ENTRY *                                                          D.107 00510
                511 **************                                                           D.107 00511
                512 ALOG     ENTR                                                        D.107 00512
                513          FSE     ALOG,LOGX,ALOGXT                                    D.107 00513
                514 ************************************                                 D.107 00514
                515 * FIRST SEPARATE EXPONENT AND MANTISSA *                             D.107 00515
                516 ************************************                                 D.107 00516
                517          LDA     3,1                                                 D.107 00517
                518          JAN     ALOG03          NEGATIVE ARGUMENT                   D.107 00518
                519          JAZ     ALOG03          ZERO ARGUMENT                       D.107 00519
                520          TAB                                                         D.107 00520
                521          ANA     H177            MASK OUT EXPONENT                   D.107 00521
                522          ORA     H40000          BIAS FRACTION                       D.107 00522
                523          STA     X                                                   D.107 00523
                524          LDA     1,1                                                 D.107 00524
                525          STA     X+1                                                 D.107 00525
                526          TBA                                                         D.107 00526
                527          LSRA    7                                                   D.107 00527
                528          SUB     H200            UNBIAS IT                           D.107 00528
                529          STA     EXP                                                 D.107 00529
                530          FLT     EXP                                                 D.107 00530
                531          FMU                                                         D.107 00531
                532          DATA    LN2                                                 D.107 00532
                533          FST     EXP                                                 D.107 00533
                534 ************************************************                     D.107 00534
                535 * FIRST CALCULATE (X-V2/2)/(X+V2/2)=U *                             D.107 00535
                536 ************************************************                     D.107 00536
                537          FLD     X               X                                   D.107 00537
                538          FAD                     X+V2/2                              D.107 00538
                539          DATA    C00VR2                                              D.107 00539
                540          FST     NEWX                                                D.107 00540
                541          FLD     X               X                                   D.107 00541
                542          FSB                     X-V2/2                              D.107 00542
                543          DATA    C00VR2                                              D.107 00543
                544          FDV                                                         D.107 00544
                545          DATA    NEWX                                                D.107 00545
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                546             FST     NEWX
                547 *
                548             FLD     NEWX            CALCULATE U**2
                549             FMU
                550             DATA    NEWX
                551             FST     X
                552 ************************
                553 * PERFORM ITERATIONS *
                554 ************************
                555             FLD     A5              A(5)
                556             FMU                     A(5)*U**2
                557             DATA    X
                558             FAD                     A(3)+A(5)*U**2
                559             DATA    A3
                560             FMU                     U**2(A(3)+A(5)*U**2)
                561             DATA    X
                562             FAD                     A(1)+U**2(A(3)+A(5)*U**2)
                563             DATA    A1
                564             FMU                     U(A(1)+U**2(A(3)+A(5)*U**2))
                565             DATA    NEWX
                566             FAD                     -1/2LN2+U(A(1)+U**2(A(3)+A(5)*U**2))
                567             DATA    HALFLN
                568             FAD                     ADD EXPONENT FACTOR
                569             DATA    EXP
                570             FST     Y
                571             LDA     Y
                572             LDB     Y+1
                573             ROF
                574 ALOG02      LDX     LOGX            RESTORE ORIGINAL X
                575             JMP     ALOGXT          EXIT
                576 ALOGXT      BES     0
                577 ALOG03      TZB                     ANNOUNCE INVALID ARGUMENT
                578             LDAI    2
                579             CALL    $EE
                580             ZERO    2
                581             SOF
                582             JMP     ALOG02          GO EXIT
                583 LOGX        BSS     1               INITIAL X
                584 H177        DATA    0177
                585 H40000      DATA    040000
                586 X           BSS     2
                587 H377        DATA    0377
                588 H200        DATA    0200
                589 EXP         BSS     2               EXPONENTIL FACTOR
                590 LN2         DATA    16472,23686     LN2
                591 SQOVR2      DATA    16474,16701     √2/2
                592 NEWX        BSS     2               [X-√2/2]/[X<√2/2]
                593 Y           BSS     2               INTERMEDIATE RESULTS
                594 HALFLN      DATA    -16345,23686    -1/2LN2
                595 A1          DATA    16704,1         2.000000815
                596 A3          DATA    16469,9993      0.666445069
                597 A5          DATA    16362,8319      0.415054254
                598 LOGEND      CONT                                        D.107 00598
                599             END                                           07 00599

ENTRY NAMES
000165 R ALOG
EXTERNAL NAMES
000200 E $EE    000155 E $NML   000031 E $PC    000160 E $QK
000033 E $QM    000076 E $QN    000167 E $SE    000123 E XDDI
000151 E XDMU   000146 E XDSU
SYMBOLS
000020 A $BIT   000200 E $EE    000155 E $NML   000031 E $PC
000160 E $QK    000033 E $QM    000076 E $QN    000167 E $SE
000165 R ALOG   000000 R LN     000037 R LN1    000222 R LN2E
000211 R LNA    000213 R LNE    000221 R LNE1   000224 R LNEM
000174 R LNER   000073 R LNF    000113 R LNI    000225 R LNK1
000226 R LNK3   000045 R LNLP   000171 R LNP    000077 R LNP1
000106 R LNP2   000214 R LNSX   000215 R LNT    000227 R LNT1
000245 R LNT2   000217 R LNV    000205 R LNW    000162 R LNZ
000001 A VORTEX 000001 A X      000123 E XDDI   000151 E XDMU
000146 E XDSU
  0 ERRORS ASSEMBLY COMPLETE


  235  $BIT      282   315   353   362   371   410   453
    0  $EE        45   392   579
    0  $NML       46   372
    0  $PC        47   289
    0  $QK        58    59
    0  $QL        97    98
    0  $QM       131   132
    0  $QN       152   153
    0  $SE       167   168
  595  A1        563
  596  A3        559
  597  A5        555
  382  ALOG       11    40   313
  574  ALOG02    582
  577  ALOG03    518   519
  576  ALOGXT    513   575
  589  EXP       529   530   533   569
   61  FRMWR1     57    96   130   151   173
```

64	FRMWR2	55	94	128	149	169	182	186		
66	FRMWR3	60	63	99	102	133	136	154	157	
584	H177	521								
588	H200	528								
585	H40000	522								
594	HALFLN	567								
259	LN	386								
297	LN1	284								
590	LN2	532								
413	LN2E	291								
405	LNA	274	277	279	280	312	319	326	327	330
		331	342	345	346	361	370			
406	LNE	276	281							
412	LNE1	278	373							
415	LNEM	275								
390	LNER	269	270							
326	LNF	318								
342	LNI	310								
416	LNK1	356	365							
417	LNK3	352								
304	LNLP	314	321	338						
385	LNP	266								
329	LNP1	298	304	305	308	311				
335	LNP2	300	306	307						
407	LNSX	259	380							
408	LNT	354	355	359	363	364	368			
421	LNT1	297	299							
438	LNT2	299	309							
409	LNV	261	262	292	293	332	333	336	337	375
		399	400							
399	LNW	344								
379	LNZ	395	401							
598	LOGEND	500								
583	LOGX	513	574							
501	NEWLOG	197								
592	NEWX	540	545	546	548	550	565			
0	P	74	84	110	118	174	175	178	189	190
		191								
170	SQFT1	166								
591	SQQVR2	539	543							
1	VORTEX	53	54	56	92	93	95	126	127	129
		147	148	150	165	171	172	185	195	196
		204	206	208	217	219	221	230	232	234
		243	245	247						
257	X	267	268	313	320	523	525	537	541	551
		557	561							
0	XDAD	205	207							
0	XDDI	244	246							
0	XDMU	231	233							
0	XDSU	218	220							
593	Y	570	571	572						

```
000001 A     1 VORTEX SET     1                                                                  06 00001
             2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE          06 00002
             3 *                                                                                06 00003
             4 *    V.D.M.  PART  NO.        92L0506-123E                                       06 00004
             5 *                                                                                06 00005
             6 *                                      RELEASE     10-15-73                      06 00006
             7 *                                                                                06 00007
             8 *               EXP                                                              06 00008
             9 *                                                                                06 00009
            10 *                                                                                06 00010
            11          TITLE   EXP                                                             06 00011
            12 ************************************************************************        06 00012
            13 *                                                                      *        06 00013
            14 *               R E A L   E X P O N E N T I A L ( E X P )              *        06 00014
            15 *                                                                      *        06 00015
            16 * FUNCTION: TO COMPUTE THE EXPONENTIAL OF A REAL ARGUMENT. THE METHOD  *        06 00016
            17 *           IS TO FACTOR THE EXPONENTIAL INTO A PRODUCT OF            *        06 00017
            18 *           EXPONENTIALS OF POWERS OF 2, DOWN TO 2**-8. THE REMAINING  *        06 00018
            19 *           FACTOR IS APPROXIMATED BY A FIXED-POINT POLYNOMIAL OF     *        06 00019
            20 *           2ND DEGREE.                                               *        06 00020
            21 *                                                                     *        06 00021
            22 * ENTRY: NO SPECIAL CONDITIONS                                       *        06 00022
            23 *                                                                     *        06 00023
            24 * CALLING SEQUENCE: JMPM EXP                                         *        06 00024
            25 *                    DATA -- ADDRESS OF REAL ARG R                    E.1 ********
            26 *                                                                     *        06 00026
            27 * EXIT: AB=E**R                                                      *        06 00027
            28 *       OVFL=0 IF NO ERROR                                            *        06 00028
            29 *                                                                     *        06 00029
            30 * ERRORS: UNDERFLOW: AB=0                                            *        06 00030
            31 *          OVERFLOW : AB=MAX REAL NUMBER                              *        06 00031
            32 *                     MESSAGE 'FUNC ARG' OUTPUT                       *        06 00032
            33 *          BOTH: OVFL SET                                             *        06 00033
            34 *                                                                     *        06 00034
            35 ************************************************************************        06 00035
            37 ***********                                                                     06 00037
            38 * ENTRIES *                                                                     06 00038
            39 ***********                                                                     06 00039
            40          NAME    EXP                                                         06 00040
            42 ***************                                                               06 00042
            43 * EXTERNALS *                                                                 06 00043
            44 ***************                                                               06 00044
            45          EXT     $EE             ERROR MESSAGE PROCESSOR                     06 00045
            46          EXT     $NML            REAL NORMALIZE                              06 00046
            48 *********                                                                     06 00048
            49 * MACRO *                                                                     06 00049
            50 *********                                                                     06 00050
            51 FAD      MAC                                                                 06 00051
            52          IFT     VORTEX-3                                            D.106   00052
            53          IFF     VORTEX-4                                            D.106   00053
            54          GOTO    FRMWR2                                              D.106   00054
            55          IFT     VORTEX-1                                            D.106   00055
            56          GOTO    FRMWR1                                              D.106   00056
            57          EXT     $QK             REAL ADD                            D.106   00057
            58          CALL    $QK                                                 D.106   00058
            59          GOTO    FRMWR3                                              D.106   00059
            60 FRMWR1   CONT                                                        D.106   00060
            61          DATA    0105134         BCS REAL ADD                        D.106   00061
            62          GOTO    FRMWR3                                              D.106   00062
            63 FRMWR2   CONT                                                        D.106   00063
            64          DATA    0105410         FPP REAL ADD                        D.106   00064
            65 FRMWR3   CONT                                                        D.106   00065
            66          EMAC                                                          06    00066
            68 * FLOAT FIXED TO REAL                                                D.106   00068
            69 FLT      MAC                                                         D.106   00069
            70          DATA    0105425                                             D.106   00070
            71          DATA    P(1)                                                D.106   00071
            72          EMAC                                                        D.106   00072
            76 *********                                                             D.106   00076
            77 * MACRO *                                                             D.106   00077
            78 *********                                                             D.106   00078
            79 FLD      MAC                                                         D.106   00079
            80          DATA    0105420         FPP LOAD                            D.106   00080
            81          DATA    P(1)                                                D.106   00081
            82          EMAC                                                        D.106   00082
            85 *********                                                               06    00085
            86 * MACRO *                                                               06    00086
            87 *********                                                               06    00087
            88 FMU      MAC                                                           06    00088
            89          IFT     VORTEX-3                                            D.106   00089
            90          IFF     VORTEX-4                                            D.106   00090
            91          GOTO    FRMWR2                                              D.106   00091
            92          IFT     VORTEX-1                                            D.106   00092
            93          GOTO    FRMWR1                                              D.106   00093
            94          EXT     $QM             REAL MULTIPLY                       D.106   00094
            95          CALL    $QM                                                 D.106   00095
            96          GOTO    FRMWR3                                              D.106   00096
            97 FRMWR1   CONT                                                        D.106   00097
            98          DATA    0105074         BCS REAL MULTIPLY                   D.106   00098
            99          GOTO    FRMWR3                                              D.106   00099
           100 FRMWR2   CONT                                                        D.106   00100
           101          DATA    0105416         FPP REAL MULTIPLY                   D.106   00101
           102 FRMWR3   CONT                                                        D.106   00102
```

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                  103           EMAC                                                    06 00103
                  104 * FIX REAL TO FIXED                                            D.106 00104
                  105 FIX       MAC                                                  D.106 00105
                  106           DATA      0105621                                    D.106 00106
                  107           DATA      P(1)                                       D.106 00107
                  108           EMAC                                                 D.106 00108
                  112 *********                                                      D.106 00112
                  113 * MACRO *                                                      D.106 00113
                  114 *********                                                      D.106 00114
                  115 FST       MAC                                                  D.106 00115
                  116           DATA      0105600       FPP STORE                    D.106 00116
                  117           DATA      P(1)                                       D.106 00117
                  118           EMAC                                                 D.106 00118
                  121 *********                                                         06 00121
                  122 * MACRO *                                                         06 00122
                  123 *********                                                         06 00123
                  124 FDV       MAC                                                     06 00124
                  125           IFT       VORTEX-3                                   D.106 00125
                  126           IFF       VORTEX-4                                   D.106 00126
                  127           GOTO      FRMWR2                                     D.106 00127
                  128           IFT       VORTEX-1                                   D.106 00128
                  129           GOTO      FRMWR1                                     D.106 00129
                  130           EXT       $QN           REAL DIVIDE                  D.106 00130
                  131           CALL      $QN                                        D.106 00131
                  132           GOTO      FRMWR3                                     D.106 00132
                  133 FRMWR1    CONT                                                 D.106 00133
                  134           DATA      0105034       BCS REAL DIVIDE              D.106 00134
                  135           GOTO      FRMWR3                                     D.106 00135
                  136 FRMWR2    CONT                                                 D.106 00136
                  137           DATA      0105401       FPP REAL DIVIDE              D.106 00137
                  138 FRMWR3    CONT                                                 D.106 00138
                  139           EMAC                                                    06 00139
                  142 *********                                                         06 00142
                  143 * MACRO *                                                         06 00143
                  144 *********                                                         06 00144
                  145 FSE       MAC                                                  D.106 00145
                  146           IFT       VORTEX-1                                   D.106 00146
                  147           GOTO      SOFT1                                      D.106 00147
                  148           EXT       $SE                                        D.106 00148
                  149           CALL      $SE                                        D.106 00149
                  150           GOTO      FRMWR2                                     D.106 00150
                  151 SOFT1     CONT                                                 D.106 00151
                  152           IFT       VORTEX-2                                   D.106 00152
                  153           IFF       VORTEX-4                                   D.106 00153
                  154           GOTO      FRMWR1                                     D.106 00154
                  155           STX       P(2)          SAVE X                       D.106 00155
                  156           LDAE      P(1)                                       D.106 00156
                  157           TAX                                                  D.106 00157
                  158           IAR                                                  D.106 00158
                  159           STA       P(3)          SET RETURN ADDR              D.106 00159
                  160           LDA       0,1           FETCH ADDR OF ARGUMENT       D.106 00160
                  161           TAX                                                  D.106 00161
                  162           JAN       *-2                                        D.106 00162
                  163           GOTO      FRMWR2                                     D.106 00163
                  164 FRMWR1    CONT                                                 D.106 00164
                  165           DATA      0105036       BCS XFER PARAMETERS          D.106 00165
                  166           IFT       VORTEX-4                                   D.106 00166
                  167           GOTO      FRMWR2                                     D.106 00167
                  168           DATA      1                                          D.106 00168
                  169           BSS       1                                          D.106 00169
                  170           STX       P(2)          SAVE X                       D.106 00170
                  171           LDXE      P(1)                                       D.106 00171
                  172           STX       P(3)                                       D.106 00172
                  173           LDXE      *-5           FETCH ADDR OF ARG            E.1   ******
                  174 FRMWR2    CONT                                                 D.106 00174
                  175           EMAC                                                 D.106 00175
                  177 FSB       MAC                                                  D.106 00177
                  178           DATA      0105450                                    D.106 00178
                  179           EMAC                                                 D.106 00179
                  182 *********                                                         06 00182
                  183 * MACRO *                                                         06 00183
                  184 *********                                                         06 00184
                  185 XMU       MAC                                                     06 00185
                  186           IFF       VORTEX-1                                      06 00186
                  187           EXT       XDMU          FIXED-POINT MULTIPLY            06 00187
                  188           IFF       VORTEX-1                                      06 00188
                  189           CALL      XDMU                                          06 00189
                  190           IFT       VORTEX-1                                      06 00190
                  191           DATA      0105274       BCS FIXED-POINT MULTIPLY        06 00191
                  192           EMAC                                                    06 00192
                  194           IFT       VORTEX-3                                   D.106 00194
                  195           IFF       VORTEX-4                                   D.106 00195
                  196           GOTO      FPPEXP                                     D.106 00196
                  198 **************                                                    06 00198
                  199 * SET BLOCK *                                                     06 00199
                  200 **************                                                    06 00200
       000022 A   201 $BIT      SET       18            PUT LAST FOR 18-BIT             06 00201
       000020 A   202 $BIT      SET       16            PUT LAST FOR 16-BIT             06 00202
       000001 A   203 X         SET       1                                             06 00203
                  205 ***************                                                   06 00205
                  206 * INITIALIZE *                                                    06 00206
                  207 ***************                                                   06 00207
000000 074215 A   208 EX        STX       EXSX          SAVE X                          06 00208
```

```
000001 014217 A  209          LDA     EXF1          LOAD AB=1.0                                    06 00209
000002 005002 A  210          TZB                                                                  06 00210
000003 054213 A  211          STA     EXV           INITIALIZE VALUE=1.0                           06 00211
000004 064213 A  212          STB     EXV+1                                                        06 00212
000005 006010 A  213          LDAI    EXA                                                          06 00213
000006 000226 R
000007 054174 A  214          STA     EXPT          INITIALIZE TABLE POINTER                       06 00214
                 215 ****************                                                              06 00215
                 216 * GET ARGUMENT *                                                             06 00216
                 217 ****************                                                              06 00217
000010 034141 A  218          LDX     EXPP                                                         06 00218
000011 015000 A  219          LDA     0,X           LOAD ARGUMENT INTO AB                          06 00219
000012 025001 A  220          LDB     1,X                                                          06 00220
000013 054201 A  221          STA     EXSF          STORE SIGN FLAG                                06 00221
000014 001002 A  222          JAP     *+3                                                          06 00222
000015 000017 R
000016 005211 A  223          CPA                   CONVERT TO ABS VALUE                           06 00223
000017 054206 A  224          STA     EXA           SAVE HIGH-ORDER WORD IN EXA                    06 00224
000020 154204 A  225          ANA     EXMM          GET EXPONENT FIELD                             06 00225
000021 054172 A  226          STA     EXE           SAVE IN EXE                                    06 00226
000022 134203 A  227          ERA     EXA           GET HIGH WORD OF MANTISSA                      06 00227
000023 054202 A  228          STA     EXA           SAVE IN EXA                                    06 00228
000024 014167 A  229          LDA     EXE           GET EXPONENT                                   06 00229
000025 004347 A  230          LSRA    $BIT-9        RIGHT ADJUST                                   06 00230
000026 006140 A  231          SUBI    0200          UNBIAS EXPONENT                                06 00231
000027 000200 A
000030 054163 A  232          STA     EXE           STORE IN EXE                                   06 00232
000031 001002 A  233          JAP     EX1           IS EXPONENT + ?                                06 00233
000032 000054 R
000033 006120 A  234          ADDI    7             NO                                             06 00234
000034 000007 A
000035 001002 A  235          JAP     EX2           IS EXPONENT < -7 ?                             06 00235
000036 000060 R
000037 005111 A  236          IAR                   YES                                            06 00236
000040 054153 A  237          STA     EXE           BUMP EXPONENT BY 8                             06 00237
                 238 ************************************************************                 06 00238
                 239 * LARGE NEGATIVE EXPONENT. SCALE TO 8 BITS RIGHT FIXED-POINT *                06 00239
                 240 ************************************************************                 06 00240
000041 014152 A  241 EXL1     LDA     EXE           GET EXPONENT                                   06 00241
000042 001010 A  242          JAZ     EXI           SCALED OK WHEN ZERO                            06 00242
000043 000106 R
000044 014161 A  243          LDA     EXA           RESTORE HIGH WORD OF MANTISSA                  06 00243
000045 004501 A  244          LASR    1             SHIFT MANTISSA RIGHT 1                         06 00244
000046 001030 A  245          JIF     030,EXY       EXIT IF SHIFTED TO ZERO                        06 00245
000047 000141 R
000050 054155 A  246          STA     EXA           SAVE HIGH WORD OF MANTISSA                     06 00246
000051 044142 A  247          INR     EXE           BUMP EXPONENT                                  06 00247
000052 001000 A  248          JMP     EXL1          CONTINUE SHIFT LOOP                            06 00248
000053 000041 R
                 249 ******************************                                               06 00249
                 250 * ARGUMENT HAS INTEGER PART *                                               06 00250
                 251 ******************************                                               06 00251
000054 006140 A  252 EX1      SUBI    8                                                            06 00252
000055 000010 A
000056 001002 A  253          JAP     EXOU          OVERFLOW/UNDERFLOW IF EXPONENT .GT. 7          06 00253
000057 000155 R
                 254 ************************************************************************     06 00254
                 255 * EXPONENT HAS BITS LEFT OF 8 BITS TO RIGHT OF FIXED BINARY POINT *          06 00255
                 256 ************************************************************************     06 00256
000060 014133 A  257 EX2      LDA     EXE                                                          06 00257
000061 004201 A  258          ASLA    1             GET 2*EXPONENT                                 06 00258
000062 006120 A  259          ADDI    EXTO          ADD TABLE BASE ADDRESS                         06 00259
000063 000246 R
000064 054117 A  260          STA     EXPT          STORE AS TABLE POINTER                         06 00260
                 261 ************************************                                         06 00261
                 262 * LOOP TO MULTIPLY BY E**(POWER OF 2) *                                      06 00262
                 263 ************************************                                         06 00263
000065 014140 A  264 EXLP     LDA     EXA           RESTORE HIGH WORD OF MANTISSA                  06 00264
000066 004401 A  265          LASL    1             SHIFT LEFT                                     06 00265
000067 054137 A  266          STA     EXA+1         SAVE                                           06 00266
000070 154133 A  267          ANA     EXM1          CLEAR HIGH BIT                                 06 00267
000071 054134 A  268          STA     EXA           SAVE                                           06 00268
000072 134134 A  269          ERA     EXA+1         RESTORE NEW BIT                                06 00269
000073 004250 A  270          LRLA    8             SHIFT TO SIGN                                  06 00270
000074 002004 A  271          JANM    EXSS          MULTIPLY IN E**(2**N) IF BIT SET               06 00271
000075 000176 R
000076 014105 A  272          LDA     EXPT                                                         06 00272
000077 005311 A  273          DAR                   DECREMENT POINTER BY 2                         06 00273
000100 005311 A  274          DAR                                                                  06 00274
000101 054102 A  275          STA     EXPT                                                         06 00275
000102 006140 A  276          SUBI    EXTE          TEST FOR TABLE END                             06 00276
000103 000230 R
000104 001002 A  277          JAP     EXLP          LOOP TILL ALL POWERS OF 2 TO -8 DONE           06 00277
000105 000065 R
                 278 ************************************************************************     06 00278
                 279 * THERE REMAINS ONLY A FIXED-POINT FRACTION SCALED 8 BITS RIGHT. *          06 00279
                 280 * APPROXIMATE BY POLYNOMIAL TRUNCATION OF POWER SERIES          *          06 00280
                 281 ************************************************************************     06 00281
000106 014117 A  282 EXI      LDA     EXA           RESTORE HIGH-ORDER WORD                        06 00282
000107 004410 A  283          LASL    8             LEFT-JUSTIFY                                   06 00283
000110 054115 A  284          STA     EXA           SAVE FIXED-POINT ARG X                         06 00284
000111 064115 A  285          STB     EXA+1                                                        06 00285
000112 004512 A  286          LASR    10            SET AB=X/2 (FIXED POINT)                       06 00286
```

```
000113 124107 A  287          ADD     EXFX        ADD 1.0                                    06 00287
               288          XMU                  AB=X(1+X/2) (FIXED POINT)                  06 00288
000114 002000 A
000115 000000 E
000116 000226 R  289          DATA    EXA                                                    06 00289
000117 001030 A  290          JIF     030,EXX     EXIT IF ZERO                               06 00290
000120 000127 R
000121 004520 A  291          LASR    16          ADJUST TO FLOATING-POINT BIAS              06 00291
000122 114076 A  292          ORA     EXF1        AB=(FLOATING-PT) 1+X+(X**2)/2              06 00292
000123 054102 A  293          STA     EXA         STORE APPROXIMATION VALUE                  06 00293
000124 064102 A  294          STB     EXA+1                                                  06 00294
000125 002000 A  295          CALL    EXSS        MULTIPLY IN APPROXIMATION VALUE            06 00295
000126 000176 R
                 296 **************                                                          06 00296
                 297 * TEST SIGN *                                                          06 00297
                 298 **************                                                          06 00298
000127 014065 A  299 EXX      LDA     EXSF        GET SIGN FLAG                              06 00299
000130 001002 A  300          JAP     EXY         NEGATIVE ?                                 06 00300
000131 000141 R
000132 014066 A  301          LDA     EXF1        YES                                        06 00301
000133 005002 A  302          TZB                                                            06 00302
               303          FDV                  GET RECIPROCAL                             06 00303
000134 002000 A
000135 000000 E
000136 000217 R  304          DATA    EXV                                                    06 00304
000137 001000 A  305          JMP     EXZ                                                    06 00305
000140 000143 R
000141 014055 A  306 EXY      LDA     EXV         LOAD RESULT IN AB AT EXIT                  06 00306
000142 024055 A  307          LDB     EXV+1                                                  06 00307
000143 007400 A  308 EXZ      RDF                 CLEAR OVFL TO FLAG NO ERRORS               06 00308
000144 034051 A  309          LDX     EXSX        RESTORE X                                  06 00309
000145 001000 A  310          JMP     0                                                      06 00310
000146 000000 A
                 311 **************                                                          06 00311
                 312 * ENTRY/EXIT *                                                          06 00312
                 313 **************                                                          06 00313
000146           314 EXP      BES     0                                                      06 00314
                 315          FSE                 XFER PARAMETERS                            06 00315
000147 002000 A
000150 000000 E
000151 000001 A  316          DATA    1                                                      06 00316
000152           317 EXPP     BSS     1           POINTER TO ARGUMENT                        06 00317
000153 001000 A  318          JMP     EX          JUMP BACK FOR FORWARD REF                  06 00318
000154 000000 R
                 319 ******************                                                      06 00319
                 320 * OVER/UNDERFLOW *                                                      06 00320
                 321 ******************                                                      06 00321
000155 014037 A  322 EXOU     LDA     EXSF        GET ARGUMENT SIGN                          06 00322
000156 001004 A  323          JAN     EXU         UNDERFLOW IF NEGATIVE                      06 00323
000157 000172 R
000160 005101 A  324 EXO      INCR    1                                                      06 00324
000161 005111 A  325          IAR                 SET A=2                                    06 00325
000162 005002 A  326          TZB                 SET B=0                                    06 00326
000163 002000 A  327          CALL    $EE         OUTPUT MESSAGE 'FUNC ARG'                  06 00327
000164 000000 E
000165 005301 A  328          DECR    1                                                      06 00328
000166 004341 A  329          LSRA    1                                                      06 00329
000167 005012 A  330          TAB                 GET MAX VALUE IN AB                        06 00330
000170 001000 A  331          JMP     EXU+1                                                  06 00331
000171 000173 R
000172 005003 A  332 EXU      ZERO    3           CLEAR AB                                   06 00332
000173 007401 A  333          SOF                 SET OVFL TO FLAG ERROR                     06 00333
000174 001000 A  334          JMP     EXZ+1                                                  06 00334
000175 000144 R
                 335 ********************************************************               06 00335
                 336 * SERVICE SUBROUTINE TO MULTIPLY BY E**(2**N) *                         06 00336
                 337 ********************************************************               06 00337
000176 000000 A  338 EXSS     ENTR                                                           06 00338
000177 064027 A  339          STB     EXA+1       SAVE B                                     06 00339
000200 014016 A  340          LDA     EXV         LOAD VALUE                                 06 00340
000201 024016 A  341          LDB     EXV+1                                                  06 00341
               342          FMU                  FLOATING POINT MULTIPLY                    06 00342
000202 002000 A
000203 000000 E
000204           343 EXPT     BSS     1           BY E*(2**N)                                06 00343
000205 001001 A  344          JOF     EXO         TEST FOR OVERFLOW                          06 00344
000206 000160 R
000207 054007 A  345          STA     EXV         RESTORE VALUE                              06 00345
000210 064007 A  346          STB     EXV+1                                                  06 00346
000211 024015 A  347          LDB     EXA+1       RESTORE B                                  06 00347
000212 001000 A  348          JMP*    EXSS                                                   06 00348
000213 100176 R
                 349 ************************                                               06 00349
                 350 * CONSTANTS AND VARIABLES *                                           06 00350
                 351 ************************                                               06 00351
000214           352 EXE      BSS     1           EXPONENT                                   06 00352
000215           353 EXSF     BSS     1           SIGN FLAG                                  06 00353
000216           354 EXSX     BSS     1           SAVE X                                     06 00354
000217           355 EXV      BSS     2           FUNCTION VALUE                             06 00355
                 356          IFF     $BIT-18                                                06 00356
                 357          GOTO    1                                                      06 00357
000221 040300 A  358 EXF1     DATA    040300      16-BIT FLOATING-POINT 1                    06 00358
000222 000000 A  359          DATA    0                                                      06 00359
```

```
000223 040000 A   360 EXFX    DATA     040000      16-BIT FIXED-POINT 1                          06 00360
000224 000177 A   361 EXM1    DATA     0177        16-BIT MANTISSA MASK                          06 00361
000225 077600 A   362 EXMM    DATA     077600      16-BIT EXPONENT FIELD MASK                    06 00362
                  363 1       CONT                                                            06 00363
                  364         IFF      $BIT-16                                                06 00364
                  365         GOTO     2                                                      06 00365
                  366 EXF1    DATA     0201400     18-BIT FLOATING-POINT 1                    06 00366
                  367         DATA     0                                                      06 00367
                  368 EXFX    DATA     0200000     18-BIT FIXED-POINT 1                       06 00368
                  369 EXM1    DATA     0777        18-BIT MANTISSA MASK                       06 00369
                  370 EXMM    DATA     0377000     18-BIT EXPONENT FIELD MASK                 06 00370
                  371 2       CONT                                                            06 00371
000226            372 EXA     BSS      2           WORKING STORE                              06 00372
        000230 R  373 EXTE    EQU      *           TABLE START ADDRESS                        06 00373
                  374         IFF      $BIT-18                                                06 00374
                  375         GOTO     3                                                      06 00375
                  376 ********************                                                    06 00376
                  377 * 16-BIT TABLE *                                                       06 00377
                  378 ********************                                                    06 00378
000230 040300 A   379         DATA     040300      E**(2**-8)                                 06 00379
000231 020020 A   380         DATA     020020                                                 06 00380
000232 040300 A   381         DATA     040300      E**(2**-7)                                 06 00381
000233 040100 A   382         DATA     040100                                                 06 00382
000234 040301 A   383         DATA     040301      E**(2**-6)                                 06 00383
000235 000401 A   384         DATA     000401                                                 06 00384
000236 040302 A   385         DATA     040302      E**(2**-5)                                 06 00385
000237 002013 A   386         DATA     002013                                                 06 00386
000240 040304 A   387         DATA     040304      E**(2**-4)                                 06 00387
000241 010127 A   388         DATA     010127                                                 06 00388
000242 040310 A   389         DATA     040310      E**(2**-3)                                 06 00389
000243 041301 A   390         DATA     041301                                                 06 00390
000244 040322 A   391         DATA     040322      E**(2**-2)                                 06 00391
000245 013274 A   392         DATA     013274                                                 06 00392
        000246 R  393 EXT0    EQU      *                                                      06 00393
000246 040351 A   394         DATA     040351      E**(2**-1)                                 06 00394
000247 041123 A   395         DATA     041123                                                 06 00395
000250 040526 A   396         DATA     040526      E**(2**0)                                  06 00396
000251 077025 A   397         DATA     077025                                                 06 00397
000252 040766 A   398         DATA     040766      E**(2**1)                                  06 00398
000253 016311 A   399         DATA     016311                                                 06 00399
000254 041555 A   400         DATA     041555      E**(2**2)                                  06 00400
000255 014440 A   401         DATA     014440                                                 06 00401
000256 043135 A   402         DATA     043135      E**(2**3)                                  06 00402
000257 011725 A   403         DATA     011725                                                 06 00403
000260 046103 A   404         DATA     046103      E**(2**4)                                  06 00404
000261 062730 A   405         DATA     062730                                                 06 00405
000262 053707 A   406         DATA     053707      E**(2**5)                                  06 00406
000263 064200 A   407         DATA     064200                                                 06 00407
000264 067320 A   408         DATA     067320      E**(2**6)                                  06 00408
000265 045460 A   409         DATA     045460                                                 06 00409
                  410 3       CONT                                                            06 00410
                  411         IFF      $BIT-16                                                06 00411
                  412         GOTO     4                                                      06 00412
                  413 ********************                                                    06 00413
                  414 * 18-BIT TABLE *                                                       06 00414
                  415 ********************                                                    06 00415
                  416         DATA     0201401     E**(2**-8)                                 06 00416
                  417         DATA     0000400                                                06 00417
                  418         DATA     0201402     E**(2**-7)                                 06 00418
                  419         DATA     0002003                                                06 00419
                  420         DATA     0201404     E**(2**-6)                                 06 00420
                  421         DATA     0010025                                                06 00421
                  422         DATA     0201410     E**(2**-5)                                 06 00422
                  423         DATA     0040253                                                06 00423
                  424         DATA     0201420     E**(2**-4)                                 06 00424
                  425         DATA     0202553                                                06 00425
                  426         DATA     0201442     E**(2**-3)                                 06 00426
                  427         DATA     026011                                                 06 00427
                  428         DATA     0201510     E**(2**-2)                                 06 00428
                  429         DATA     0265707                                                06 00429
                  430 EXT0    EQU      *                                                      06 00430
                  431         DATA     0201646     E**(2**-1)                                 06 00431
                  432         DATA     022462                                                 06 00432
                  433         DATA     0202533     E**(2**0)                                  06 00433
                  434         DATA     0360521                                                06 00434
                  435         DATA     0203730     E**(2**1)                                  06 00435
                  436         DATA     0346227                                                06 00436
                  437         DATA     0206664     E**(2**2)                                  06 00437
                  438         DATA     0311006                                                06 00438
                  439         DATA     0214564     E**(2**3)                                  06 00439
                  440         DATA     0236520                                                06 00440
                  441         DATA     0230417     E**(2**4)                                  06 00441
                  442         DATA     0056572                                                06 00442
                  443         DATA     0257437     E**(2**5)                                  06 00443
                  444         DATA     0103772                                                06 00444
                  445         DATA     0335502     E**(2**6)                                  06 00445
                  446         DATA     0131406                                                06 00446
                  447 4       CONT                                                            06 00447
                  448         GOTO     EXPEND                                         D.106 00448
                  449 FPPEXP  CONT                                                       D.106 00449
                  450 ***************************************************************** D.106 00450
                  451 * COMPUTES EXPONENTIAL OF A FLOATING POINT NUMBER.             * D.106 00451
                  452 * USES MACON EVEN PART CONTRACTION OF GAUSSIAN CONTINUED       * D.106 00452
```

```
453 * FRACTION, (E**X=(S+X)/(S-X)) EXPECTED ERROR 3*10**-8.  *
454 ************************************************************
455 *************
456 * EXP ENTRY *
457 *************
458 EXP     ENTR
459         FSE     EXP,EXPX,EXPXT
460         LDA     0,1             SAVE VALUE
461         STA     X
462         LDA     1,1
463         STA     X+1
464         LDA     X               IS IT ZERO
465         JAZ     EXP05           YES, RETURN 1
466 ************************************
467 * IS VALUE GREATER THAN +88.0296918?*
468 ************************************
469         FLD     X
470         FSB
471         DATA    MAX
472         FST     Y
473         LDA     Y
474         JAP     EXP02
475 ************************************
476 * IS VALUE LESS THAN -180.218?  *
477 ************************************
478         FLD     MIN
479         FSB
480         DATA    X
481         FST     Y
482         LDA     Y
483         JAP     EXP03
484 ******************
485 *     Y=U/LOG2   *
486 ******************
487         FLD     X
488         FDV
489         DATA    LOG2
490         FST     Y
491 ******************
492 *     N=Y+-1/2   *
493 ******************
494         FLD     Y
495         LDA     X
496         JAP     EXP005
497         FSB
498         DATA    HALF
499         JMP     EXP010
500 EXP005 FAD
501         DATA    HALF
502 EXP010 FIX     XS0
503 ************************
504 *  CALCULATE 2 TO THEN  *
505 ************************
506         LDA     XS0
507         ADDI    0201
508         ASLA    7
509         ADD     TWO6
510         STA     THEN
511 ****************
512 *     W = Y-N  *
513 ****************
514         FLT     XS0
515         FST     XS0
516         FLD     Y
517         FSB
518         DATA    XS0
519 ******************
520 *     X =W*LOG2  *
521 ******************
522         FMU
523         DATA    LOG2
524         FST     X
525 ************************
526 * CALCULATE DENOMINATOR *
527 ************************
528 *                             CALCULATE X**2
529         FLD     X
530         FMU
531         DATA    X
532         FST     XS0
533         FLD     XS0             X**2
534         FAD                     420+X**2
535         DATA    D420
536         FMU                     X**2(420+X**2)
537         DATA    XS0
538         FAD                     15,120+X**2(420+X**2)
539         DATA    D15120
540         FST     TEMP
541 ************************
542 * CALCULATE NUMERATOR *
543 ************************
544         FLD     XS0             X**2
545         FMU                     28*X**2
```

```
                    2411 *                    ADD CIN                                                    S03 02399
                    2412 *                                                                               S03 02400
005530 015032 A     2413 X072    LDA     LTCHA,1      A                                                  S03 02401
005531 115033 A     2414         ORA     LTCHB,1      OR WITH B                                          S03 02402
005532 054322 A     2415         STA     X0AA         FIRST RESULT                                       S03 02403
005533 015033 A     2416         LDA     LTCHB,1      B                                                  S03 02404
005534 005211 A     2417         COMPL   011          COMPLEMENT                                         S03 02405
005535 155032 A     2418         ANA     LTCHA,1      AND WITH A                                         S03 02406
005536 054317 A     2419         STA     X0AB         SECOND RESULT                                      S03 02407
005537 124315 A     2420         ADD     X0AA         ADD FIRST RESULT                                   S03 02408
005540 125035 A     2421         ADD     XCIN,1       ADD CIN                                            S03 02409
005541 002000 A     2422         JMPM    X094         SAVE OVERFLOW                                      S03 02410
005542 005752 R
005543 001000 A     2423         JMP     X071         DO CARRY CALCULATION                               S03 02411
005544 005520 R
                    2424 *                                                                               S03 02412
                    2425 *       0110    ADD A AND CIN, SUBTRACT B, SUBTRACT 1                          S03 02413
                    2426 *                                                                               S03 02414
005545 015032 A     2427 X074    LDA     LTCHA,1      A                                                  S03 02415
005546 145033 A     2428         SUB     LTCHB,1      SUBTRACT B                                         S03 02416
005547 005311 A     2429         DAR                  SUBTRACT 1                                         S03 02417
005550 125035 A     2430         ADD     XCIN,1       ADD CIN                                            S03 02418
005551 002000 A     2431         JMPM    X094         SAVE OVERFLOW                                      S03 02419
005552 005752 R
005553 015035 A     2432         LDA     XCIN,1       CIN                                                S03 02420
005554 001010 A     2433         JAZ     X075         JUMP IF NO CARRY IN                                S03 02421
005555 005575 R
                    2434 *                                                                               S03 02422
005556 015032 A     2435         LDA     LTCHA,1      A                                                  S03 02423
005557 135033 A     2436         ERA     LTCHB,1      B                                                  S03 02424
005560 001002 A     2437         JAP     *+7          JUMP IF SIGNS THE SAME                             S03 02425
005561 005567 R
005562 015032 A     2438         LDA     LTCHA,1      A                                                  S03 02426
005563 001004 A     2439         JAN     X097         SET CARRY IF A NEGATIVE                            S03 02427
005564 005771 R
005565 001000 A     2440         JMP     X096         NO CARRY                                           S03 02428
005566 005762 R
                    2441 *                                                                               S03 02429
005567 015032 A     2442         LDA     LTCHA,1      A                                                  S03 02430
005570 145033 A     2443         SUB     LTCHB,1      LESS B                                             S03 02431
005571 001002 A     2444         JAP     X097         SET CARRY IF A GREATER                             S03 02432
005572 005771 R
005573 001000 A     2445         JMP     X096         NO CARRY                                           S03 02433
005574 005762 R
                    2446 *                                                                               S03 02434
005575 014227 A     2447 X075    LDA     X099         RESULT                                             S03 02435
005576 005211 A     2448         CPA                                                                     S03 02436
005577 001010 A     2449         JAZ     X096         NO CARRY ON -1 RESULT                              S03 02437
005600 005762 R
005601 001000 A     2450         JMP     X097         SET CARRY                                          S03 02438
005602 005771 R
                    2451 *                                                                               S03 02439
                    2452 *       0111    COMPLEMENT B, AND WITH A, SUBTRACT 1, ADD CIN                  S03 02440
                    2453 *                                                                               S03 02441
005603 015033 A     2454 X076    LDA     LTCHB,1      B                                                  S03 02442
005604 005211 A     2455         COMPL   011          COMPLEMENT                                         S03 02443
005605 155032 A     2456         ANA     LTCHA,1      AND WITH A                                         S03 02444
005606 005311 A     2457         DAR                  SUBTRACT 1                                         S03 02445
005607 125035 A     2458         ADD     XCIN,1       ADD CIN                                            S03 02446
005610 002000 A     2459         JMPM    X094         SAVE OVERFLOW                                      S03 02447
005611 005752 R
005612 015035 A     2460         LDA     XCIN,1       CIN                                                S03 02448
005613 001010 A     2461         JAZ     X075         JUMP IF NO CARRY IN                                S03 02449
005614 005575 R
005615 001000 A     2462         JMP     X096         NO CARRY OUT                                       S03 02450
005616 005762 R
                    2463 *                                                                               S03 02451
                    2464 *       1000    AND A AND B, ADD A, ADD CIN                                    S03 02452
                    2465 *                                                                               S03 02453
005617 015032 A     2466 X078    LDA     LTCHA,1      A                                                  S03 02454
005620 054234 A     2467         STA     X0AA         FIRST RESULT                                       S03 02455
005621 155033 A     2468         ANA     LTCHB,1      AND WITH B                                         S03 02456
005622 054233 A     2469         STA     X0AB         SECOND RESULT                                      S03 02457
005623 125032 A     2470         ADD     LTCHA,1      ADD A                                              S03 02458
005624 125035 A     2471         ADD     XCIN,1       ADD CIN                                            S03 02459
005625 002000 A     2472         JMPM    X094         SAVE OVERFLOW                                      S03 02460
005626 005752 R
005627 001000 A     2473         JMP     X071         DO CARRY CALCULATION                               S03 02461
005630 005520 R
                    2474 *                                                                               S03 02462
                    2475 *       1001    ADD A AND B, ADD CIN                                           S03 02463
                    2476 *                                                                               S03 02464
005631 015032 A     2477 X080    LDA     LTCHA,1      A                                                  S03 02465
005632 054222 A     2478         STA     X0AA         FIRST RESULT                                       S03 02466
005633 125033 A     2479         ADD     LTCHB,1      ADD B                                              S03 02467
005634 125035 A     2480         ADD     XCIN,1       ADD CIN                                            S03 02468
005635 002000 A     2481         JMPM    X094         SAVE OVERFLOW                                      S03 02469
005636 005752 R
005637 015033 A     2482         LDA     LTCHB,1      B                                                  S03 02470
005640 054215 A     2483         STA     X0AB         SECOND RESULT                                      S03 02471
005641 001000 A     2484         JMP     X071         DO CARRY CALCULATION                               S03 02472
005642 005520 R
                    2485 *                                                                               S03 02473
```

0	$SE	148	149							
604	D15120	539								
605	D2520	548								
607	D28	546								
603	D420	535								
208	EX	318								
252	EX1	233								
257	EX2	235								
372	EXA	213	224	227	228	243	246	264	266	268
		269	282	284	285	289	293	294	339	347
352	EXE	226	229	232	237	241	247	257		
358	EXF1	209	292	301						
360	EXFX	287								
282	EXI	242								
241	EXL1	248								
264	EXLP	277								
361	EXM1	267								
362	EXMM	285								
324	EXO	344								
322	EXOU	253								
314	EXP	11	40	459						
500	EXP005	496								
574	EXP01	593								
502	EXP010	499								
580	EXP02	474								
570	EXP020	595								
591	EXP03	483								
592	EXP04	587								
594	EXP05	465								
613	EXPEND	448								
317	EXPP	218								
343	EXPT	214	260	272	275					
596	EXPX	459	574							
576	EXPXT	459	575							
353	EXSF	221	299	322						
338	EXSS	271	295	348						
354	EXSX	208	309							
393	EXTO	259								
373	EXTE	276								
332	EXU	323	331							
355	EXV	211	212	304	306	307	340	341	345	346
299	EXX	290								
306	EXY	245	300							
308	EXZ	305	334							
449	FPPEXP	196								
60	FRMWR1	56	93	129	154					
63	FRMWR2	54	91	127	150	163	167			
65	FRMWR3	59	62	96	99	132	135			
602	HALF	498	501							
601	LOG2	489	523							
598	MAX	471								
600	MIN	478								
608	ONE	534								
0	P	71	81	107	117	155	156	159	170	171
		172								
151	SOFT1	147								
612	TEMP	540	553	558	559	563				
606	TWO	557								
610	TWO6	509								
611	TWON	510	569							
1	VORTEX	52	53	55	89	90	92	125	126	128
		146	152	153	166	186	188	190	194	195
203	X	219	220	461	463	464	469	480	487	495
		524	529	531	561	565	570	571	572	
0	XDMU	187	189							
609	XSQ	502	506	514	515	518	532	533	537	544
		555								
599	Y	472	473	481	482	490	494	516	562	567

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                                                                                                                    00 00001
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                                                                                                                    00 00027
                                                                                                                    E.2******
                                                                                                                    00 00028
                                                                                                                    00 00029
                                                                                                                    E.2******
000000 000000 A    31 XDCO    ENTRY
       000000 R    32 $6D     EQU     XDCO
000001 005211 A    33         CPA                  ONE'S COMPLEMENT A                                              00 00031
000002 001020 A    34         JBZ     XDC1         B=0 ?                                                           00 00032
000003 000012 R
000004 005222 A    35         CPB                  NO                                                              00 00033
000005 005122 A    36         IBR                  TWO'S COMPLEMENT B                                              00 00034
000006 004041 A    37         LRLB    1                                                                            00 00035
000007 004141 A    38         LSRB    1            CLEAR SIGN BIT OF B                                             00 00036
000010 001000 A    39         JMP*    XDCO         EXIT                                                            00 00037
000011 100000 R
000012 005111 A    40 XDC1    IAR                  TWO'S COMPLEMENT A                                              00 00038
000013 001000 A    41         JMP*    XDCO         EXIT                                                            00 00039
000014 100000 R
                   42         END                                                                                  00 00040
```

```
ENTRY NAMES
000000 R $6D     000000 R XDCO
EXTERNAL NAMES
SYMBOLS
000000 R $6D     000012 R XDC1    000000 R XDCO
   0 ERRORS ASSEMBLY COMPLETE


    32  $6D         28
     0  ENTR        11
     0  SPAC        12
    40  XDC1        34
    31  XDCO        29     32     39     41
     0  XDCOMP      10
```

```
000001 A      1 VORTEX SET     1                                                                  03 00001
              2 *  THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE         03 00002
              3 *                                                                                03 00003
              4 *    V.D.M.   PART  NO.         92L0506-148E                                     03 00004
              5 *                                                                                03 00005
              6 *                                          RELEASE      10-15-73                 03 00006
              7 *                                                                                03 00007
              8 *                 DSINCOS                                                        03 00008
              9 *                                                                                03 00009
             10 *                                                                                03 00010
             11           TITLE   DSINCOS                                                       03 00011
             12 ************************************************************************       03 00012
             13 *                                                                    *           03 00013
             14 *        D O U B L E - P R E C I S I O N   S I N E / C O S I N E     *           03 00014
             15 *                                                                    *           03 00015
             16 *             ( $ D S I , D S I N , $ D C O , D C O S )              *           03 00016
             17 *                                                                    *           03 00017
             18 * FUNCTION: TO COMPUTE THE SINE OR COSINE OF A DOUBLE-PRECISION     *           03 00018
             19 *           ARGUMENT D. THE METHOD IS TO REDUCE THE RANGE OF D      *           03 00019
             20 *           TO  0.LE.D.LT.PI/4 AND COMPUTE THE FUNCTION BY USING   *           03 00020
             21 *           CHEBYSHEV POLYNOMIAL APPROXIMATION TO THE TELESCOPED   *           03 00021
             22 *           SERIES.                                                *           03 00022
             23 *                                                                  *           03 00023
             24 * ENTRY: $DSI,$DCO: AC=D                                          *           03 00024
             25 *         DSIN,DCOS: D IN CALL SEQ                                 *           03 00025
             26 *                                                                  *           03 00026
             27 * CALLING SEQUENCE: JMPM DSIN(OR DCOS)                            *           03 00027
             28 *                    DATA ADDRESS OF D                             *           03 00028
             29 *                                                                  *           03 00029
             30 * EXIT : AC=RESULT                                                *           03 00030
             31 *                                                                  *           03 00031
             32 ************************************************************************       03 00032
             34 ***********                                                                    03 00034
             35 * ENTRIES *                                                                    03 00035
             36 ***********                                                                    03 00036
             37          NAME    $DSI            SINE: AC=D                                    03 00037
             38          NAME    $DCO            COSINE: AC=D                                  03 00038
             39          NAME    DSIN            SINE: D IN CALL SEQ                           03 00039
             40          NAME    DCOS            COSINE: D IN CALL SEQ                         03 00040
             42 *************                                                                  03 00042
             43 * EXTERNALS *                                                                  03 00043
             44 *************                                                                  03 00044
             46 * DOUBLE PRECISION LOAD                                          D.100 00046
             47 FLDD     MAC                                                    D.100 00047
             48          IFT     VORTEX-3                                       D.100 00048
             49          IFF     VORTEX-4                                       D.100 00049
             50          GOTO    FRMWR1                                         D.100 00050
             51          EXT     $DLO            DP LOAD                        D.100 00051
             52          CALL    $DLO                                           D.100 00052
             53          GOTO    FRMWR2                                         D.100 00053
             54 FRMWR1   CONT                                                   D.100 00054
             55          DATA    0105522         FPP DP LOAD                    D.100 00055
             56 FRMWR2   CONT                                                   D.100 00056
             57          EMAC                                                   D.100 00057
             58          EXT     AC              DP ACCUMULATOR                 D.100 00058
             60          EXT     $DNO            DP NORMALIZE                           00060
             62 *********                                                                   00062
             63 * MACRO *                                                                   00063
             64 *********                                                                   00064
             65 FSE      MAC                                                               00065
             66          IFT     VORTEX-2                                       D.100 00066
             67          IFF     VORTEX-4                                       D.100 00067
             68          GOTO    FRMWR1                                         D.100 00068
             69          EXT     $SE                                            D.100 00069
             70          CALL    $SE             XFER PARAMETERS                D.100 00070
             71          GOTO    FRMWR2                                         D.100 00071
             72 FRMWR1   CONT                                                   D.100 00072
             73          DATA    0105036         BCS XFER PARAMETERS            D.100 00073
             74 FRMWR2   CONT                                                   D.100 00074
             75          EMAC                                                           00075
             78 * DOUBLE PRECISION STORE                                        D.100 00078
             79 FSTD     MAC                                                    D.100 00079
             80          IFT     VORTEX-3                                       D.100 00080
             81          IFF     VORTEX-4                                       D.100 00081
             82          GOTO    FRMWR1                                         D.100 00082
             83          EXT     $STO                                           D.100 00083
             84          CALL    $STO            DP STORE                       D.100 00084
             85          GOTO    FRMWR2                                         D.100 00085
             86 FRMWR1   CONT                                                   D.100 00086
             87          DATA    0105710         FPP DP STORE                   D.100 00087
             88 FRMWR2   CONT                                                   D.100 00088
             89          EMAC                                                   D.100 00089
             91          EXT     $ZC             DP NEGATE                      D.100 00091
             93 * DOUBLE PRECISION ADD                                          D.100 00093
             94 FADD     MAC                                                    D.100 00094
             95          IFT     VORTEX-3                                       D.100 00095
             96          IFF     VORTEX-4                                       D.100 00096
             97          GOTO    FRMWR1                                         D.100 00097
             98          EXT     $ZK                                            D.100 00098
             99          CALL    $ZK             DP ADD                         D.100 00099
            100          GOTO    FRMWR2                                         D.100 00100
            101 FRMWR1   CONT                                                   D.100 00101
            102          DATA    0105503         FPP DP ADD                     D.100 00102
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                    103 FRMWR2  CONT                                                    D.103 00103
                    104         EMAC                                                    D.103 00104
                    107 * DOUBLE PRECISION SUBTRACT                                     D.103 00107
                    108 FSBD    MAC                                                     D.103 00108
                    109         IFT     VORTEX-3                                        D.103 00109
                    110         IFF     VORTEX-4                                        D.103 00110
                    111         GOTO    FRMWR1                                          D.103 00111
                    112         EXT     $ZL                                             D.103 00112
                    113         CALL    $ZL             DP SUBTRACT                     D.103 00113
                    114         GOTO    FRMWR2                                          D.103 00114
                    115 FRMWR1  CONT                                                    D.103 00115
                    116         DATA    0105543         FPP DP SUBTRACT                 D.103 00116
                    117 FRMWR2  CONT                                                    D.103 00117
                    118         EMAC                                                    D.103 00118
                    121 * DOUBLE PRECISION MULTIPLY                                     D.103 00121
                    122 FMUD    MAC                                                     D.103 00122
                    123         IFT     VORTEX-3                                        D.103 00123
                    124         IFF     VORTEX-4                                        D.103 00124
                    125         GOTO    FRMWR1                                          D.103 00125
                    126         EXT     $ZM                                             D.103 00126
                    127         CALL    $ZM             DP MULTIPLY                     D.103 00127
                    128         GOTO    FRMWR2                                          D.103 00128
                    129 FRMWR1  CONT                                                    D.103 00129
                    130         DATA    0105506                                         D.103 00130
                    131 FRMWR2  CONT                                                    D.103 00131
                    132         EMAC                                                    D.103 00132
                    135 * DOUBLE PRECISION DIVIDE                                       D.103 00135
                    136 FDVD    MAC                                                     D.103 00136
                    137         IFT     VORTEX-3                                        D.103 00137
                    138         IFF     VORTEX-4                                        D.103 00138
                    139         GOTO    FRMWR1                                          D.103 00139
                    140         EXT     $ZN                                             D.103 00140
                    141         CALL    $ZN             DP DIVIDE                       D.103 00141
                    142         GOTO    FRMWR2                                          D.103 00142
                    143 FRMWR1  CONT                                                    D.103 00143
                    144         DATA    0105535         FPP DP DIVIDE                   D.103 00144
                    145 FRMWR2  CONT                                                    D.103 00145
                    146         EMAC                                                    D.103 00146
                    148 * FLOATING TO FIX                                               E.1********
                    149 FIX     MAC                                                     E.1********
                    150         DATA    0105621         FPP FIX                         E.1********
                    151         DATA    P(1)                                            E.1********
                    152         EMAC                                                    E.1********
                    154 * FIX TO FLOATING                                               E.1********
                    155 FLT     MAC                                                     E.1********
                    156         DATA    0105425         FPP FLOAT                       E.1********
                    157         DATA    P(1)                                            E.1********
                    158         EMAC                                                    E.1********
                    161 ************                                                        03 00149
                    162 * SET BLOCK *                                                    03 00150
                    163 ************                                                        03 00151
000022 A            164 $BIT    SET     18              PUT LAST FOR 18-BIT             03 00152
000020 A            165 $BIT    SET     16              PUT LAST FOR 16-BIT             03 00153
000001 A            166 X       SET     1               X-REG                           03 00154
                    168 ************                                                        03 00156
                    169 * DSIN ENTRY *                                                  03 00157
                    170 ************                                                        03 00158
000000 000000 A     171 DSIN    ENTR                                                    03 00159
                    172         FSE                     XFER PARAMETERS                 03 00160
000001 002000 A
000002 000000 E
000003 000001 A     173         DATA    1                                               03 00161
000004              174 DSP     BSS     1               POINTER TO U                    03 00162
                    175         FLDD                    LOAD U IN AC                V&103 00163
000005 002000 A
000006 000000 E
000007 100004 R     176         DATA    (DSP)*                                          03 00164
000010 054332 A     177         STA     DSSA            SAVE A                          03 00165
000011 006010 A     178         LDAI    DSIN+0100000                                    03 00166
000012 100000 R
000013 054027 A     179         STA     $DSI            LOAD EXIT                       03 00167
000014 001000 A     180         JMP     DS01            CALL $DSI                   V&103 00168
000015 000045 R
                    181 ************                                                        03 00169
                    182 * DCOS ENTRY *                                                  03 00170
                    183 ************                                                        03 00171
000016 000000 A     184 DCOS    ENTR                                                    03 00172
                    185         FSE                     XFER PARAMETERS                 03 00173
000017 002000 A
000020 000002 E
000021 000001 A     186         DATA    1                                               03 00174
000022              187 DCP     BSS     1               POINTER TO U                    03 00175
                    188         FLDD                    LOAD U IN AC                V&103 00176
000023 002000 A
000024 000006 E
000025 100022 R     189         DATA    (DCP)*                                          03 00177
000026 054314 A     190         STA     DSSA            SAVE A                          03 00178
000027 006010 A     191         LDAI    DCOS+0100000                                    03 00179
000030 100016 R
000031 001000 A     192         JMP     DC01                                        V&103 00181
000032 000037 R
                    193 ************                                                        03 00182
                    194 * $DCO ENTRY *                                                  03 00183
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                    195 ****************                                                                    03 00184
000033 000000 A     196 $DCO    ENTR                                                                        03 00185
                    197         IFT     VORTEX-1                                                        D.103 00186
                    198         IFF     VORTEX-2                                                        D.103 00187
                    199         GOTO    FRMWR1                                                          D.103 00188
                    200         FLDD                                                                    V&103 00189
                    201         DATA    AC                                                              V&103 00190
                    202 FRMWR1  CONT                                                                    V&103 00191
000034 054306 A     203         STA     DSSA            SAVE A                                              03 00192
000035 006010 A     204         LDAI    $DCO+0100000                                                    E.1*******
000036 100033 R
000037 054003 A     205 DC01    STA     $DSI            MOVE RETURN                                     E.1*******
000040 005101 A     206         INCR    1               A=1 FOR COSINE ENTRY                                03 00195
000041 001000 A     207         JMP     DS1                                                                 03 00196
000042 000046 R
                    208 ****************                                                                    03 00197
                    209 * $DSI ENTRY *                                                                     03 00198
                    210 ****************                                                                    03 00199
000043 000000 A     211 $DSI    ENTR                                                                        03 00200
                    212         IFT     VORTEX-1                                                        D.103 00201
                    213         IFF     VORTEX-2                                                        D.103 00202
                    214         GOTO    FRMWR1                                                          D.103 00203
                    215         FLDD                                                                    V&103 00204
                    216         DATA    AC                                                              V&103 00205
                    217 FRMWR1  CONT                                                                    V&103 00206
000044 054276 A     218         STA     DSSA            SAVE A                                              03 00207
000045 005001 A     219 DS01    TZA                     A=0 FOR +SINE ENTRY                             V&103 00208
                    220         IFT     VORTEX-3                                                        E.1*******
                    221         IFF     VORTEX-4                                                        E.1*******
                    222         GOTO    DSCFPP                                                          E.1*******
000046 054266 A     223 DS1     STA     DSFL            STORE SIN/COS FLAG                                  03 00209
000047 064274 A     224         STB     DSSB            SAVE B                                              03 00210
000050 074274 A     225         STX     DSSX            SAVE X                                              03 00211
                    226         FSTD                    STORE U IN DSU                                  V&103 00212
000051 002000 A
000052 000000 E
000053 000325 R     227         DATA    DSU                                                                 03 00213
000054 002000 A     228         CALL    *DNO            NORMALIZE U                                         03 00214
000055 000000 E
000056 000325 R     229         DATA    DSU                                                                 03 00215
000057 014246 A     230         LDA     DSU+1           GET SIGN                                            03 00216
000060 001002 A     231         JAP     DS2             '-' ?                                               03 00217
000061 000072 R
000062 005211 A     232         CPA                     CONVERT TO '+'                                      03 00218
000063 054242 A     233         STA     DSU+1                                                               03 00219
000064 014250 A     234         LDA     DSFL                                                                03 00220
000065 005311 A     235         DAR                                                                         03 00221
000066 001010 A     236         JAZ     DS2             SINE ?                                              03 00222
000067 000072 R
000070 044244 A     237         INR     DSFL            YES, SET SIN/COS FLAG TO 2                          03 00223
000071 044243 A     238         INR     DSFL                                                                03 00224
                    239 ********************                                                                03 00225
                    240 * GET U MOD PI/2 *                                                                 03 00226
                    241 ********************                                                                03 00227
                    242 DS2     FLDD                    GET U                                           V&103 00228
000072 002000 A
000073 000024 E
000074 000325 R     243         DATA    DSU                                                                 03 00229
                    244         FDVD                    DIVIDE BY PI/2                                  V&103 00230
000075 002000 A
000076 000000 E
000077 000402 R     245         DATA    DSFS                                                                03 00231
                    246         FSTD                    STORE IN DSFS                                   V&103 00232
000100 002000 A
000101 000058 E
                    247         IFT     VORTEX-1                                                        V&103 00233
                    248         IFF     VORTEX-2                                                        V&103 00234
                    249         GOTO    FRMWR1                                                          V&103 00235
                    250         DATA    FC              STORE IN AC IF FPP IN USE                       V&103 00236
                    251         FLDD                                                                    V&103 00237
                    252         DATA    AC                                                              V&103 00238
                    253         FSTD                                                                    V&103 00239
                    254 FRMWR1  CONTA                                                                   V&103 00240
000102 002000 A     255         DATA    DSFS                                                                03 00241
000103 000000 E     256         FLDD    DSFS            GET EXPONENT                                        03 00242
000104 000325 R     257         DATA    DSU                                                                 03 00243
000105 002000 A     258         CALL    *DNO            SAVE SHIFT COUNT                                    03 00244
000106 000000 E     259         TJA,N   DS3             IS THERE AN INTEGER PART ?                          03 00245
000107 000402 R
000110 000111 A     260         JAZ     DS3                                                                 03 00246
000111 000000 E
                    261 ********************************************************                            03 00247
                    * SEPARATE INTEGER AND FRACTIONAL PARTS *                                             03 00248
                    ********************************************************                            03 00249
000112 000000 E     262         SUBM    DSFS                                                                03 00250
000113 000115 A     263         JAM     *+2             ANY FRACTIONAL PART ?                               03 00251
000114 000117 A     264         LDFI    0               NO: SET SHIFT COUNT TO MAX                          03 00252
000115 000402 R     265         STFT    DSFS            SAVE SHIFT COUNT                                    03 00253
000116 000000 E     266         LDFI    0               CLEAR SHIFT FIELD                                   03 00254
000117 000000 E     267         LDFM    *+1             CLEAR MASK FIELD                                    03 00255
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000123 014224 A  272          LDA     DSHB                                                    03 00258
000124 054213 A  273          STA     DSMF            SET SHIFT BIT                           03 00259
                 274 ********************************                                        03 00260
                 275 * LOOP TO GET INTEGER PART AND MASK *                                    03 00261
                 276 ********************************                                        03 00262
000125 006030 A  277 DSL1     LDXI    DSF2            POINT X AT OP                           03 00263
000126 000331 R
000127 014217 A  278          LDA     KM3             LOOP ENTRY                              03 00264
000130 054206 A  279          STA     DSLC            SET LOOP COUNT TO -3                    03 00265
                 280 ********************************                                        03 00266
                 281 * LOOP TO ROTATE OUT INTEGER PART *                                     03 00267
                 282 ********************************                                        03 00268
000131 015000 A  283 DSL2     LDA     0,X             LOAD 2 MANTISSA WORDS                   03 00269
000132 025001 A  284          LDB     1,X                                                     03 00270
000133 004401 A  285          LASL    1               SHIFT LEFT 1                            03 00271
000134 055000 A  286          STA     0,X             REPLACE FIRST WORD                      03 00272
000135 007400 A  287          RDF                                                             03 00273
000136 044200 A  288          INR     DSLC            BUMP LOOP COUNT                         03 00274
000137 001001 A  289          JOF     *+5             LOOP FINISHED ?                         03 00275
000140 000144 R
000141 005144 A  290          IXR                     NO, BUMP POINTER                        03 00276
000142 001000 A  291          JMP     DSL2             AND LOOP BACK                          03 00277
000143 000131 R
000144 065001 A  292          STB     1,X             RESTORE LAST WORD                       03 00278
                 293 ****************************                                            03 00279
                 294 * SHIFT INTEGER PART MASK *                                            03 00280
                 295 ****************************                                            03 00281
000145 006030 A  296          LDXI    DSMF            POINT X AT MASK FIELD                   03 00282
000146 000340 R
000147 015001 A  297          LDA     1,X             LOAD LAST TWO WORDS                     03 00283
000150 025002 A  298          LDB     2,X                                                     03 00284
000151 004501 A  299          LASR    1               EXTEND SIGN                             03 00285
000152 065002 A  300          STB     2,X             REPLACE WORD 2                          03 00286
000153 015000 A  301          LDA     0,X             LOAD FIRST TWO WORDS                    03 00287
000154 025001 A  302          LDB     1,X                                                     03 00288
000155 004501 A  303          LASR    1               EXTEND SIGN                             03 00289
000156 065001 A  304          STB     1,X             RESTORE WORD 1                          03 00290
000157 055000 A  305          STA     0,X             RESTORE WORD 0                          03 00291
000160 014165 A  306          LDA     DST                                                     03 00292
000161 005311 A  307          DAR                     DROP LOOP COUNT                         03 00293
000162 054163 A  308          STA     DST                                                     03 00294
000163 005311 A  309          DAR                                                             03 00295
000164 001002 A  310          JAP     DSL1            FINISHED ?                              03 00296
000165 000125 R
000166 014142 A  311          LDA     DSF2            YES, GET INTEGER PART                   03 00297
000167 124145 A  312          ADD     DSFL            ADD INTO SIN/COS FLAG(ONLY LOW 4 BITS IMP) 03 00298
000170 054144 A  313          STA     DSFL                                                    03 00299
                 314 ************************                                                03 00300
                 315 * GET FRACTIONAL PART *                                                 03 00301
                 316 ************************                                                03 00302
                 317          IFT     VORTEX-1                                          D.103 00303
                 318          IFF     VORTEX-2                                          D.103 00304
                 319          GOTO    FRMWR1                                            D.103 00305
                 320          FLDD                                                      V&103 00306
                 321          DATA    AC                                                V&103 00307
                 322 FRMWR1   CONT                                                      V&103 00308
                 323          FSTD                    STORE ARG IN DSF2                 V&103 00309
000171 002000 A
000172 000101 E
000173 000331 R  324          DATA    DSF2                                                    03 00310
000174 014135 A  325          LDA     DSF2+1                                                  03 00311
000175 154142 A  326          ANA     DSMF            MASK WORD 1                             03 00312
000176 054133 A  327          STA     DSF2+1                                                  03 00313
000177 014133 A  328          LDA     DSF2+2                                                  03 00314
000200 154140 A  329          ANA     DSMF+1          MASK WORD 2                             03 00315
000201 054131 A  330          STA     DSF2+2                                                  03 00316
000202 014131 A  331          LDA     DSF2+3                                                  03 00317
000203 154136 A  332          ANA     DSMF+2          MASK WORD 3                             03 00318
000204 054127 A  333          STA     DSF2+3                                                  03 00319
                 334          IFT     VORTEX-1                                          D.103 00320
                 335          IFF     VORTEX-2                                          D.103 00321
                 336          GOTO    FRMWR1                                            D.103 00322
                 337          FLDD                                                      V&103 00323
                 338          DATA    AC                                                V&103 00324
                 339 FRMWR1   CONT                                                      V&103 00325
                 340          FSBD                                                      V&103 00326
000205 002000 A
000206 000000 E
000207 000331 R  341          DATA    DSF2                                              V&103 00327
                 342          IFT     VORTEX-1                                          V&103 00328
                 343          IFF     VORTEX-2                                          V&103 00329
                 344          GOTO    FRMWR1                                            V&103 00330
                 345          JMP     DS31                                              V&103 00331
                 346 DS3      FLDD                                                      V&103 00332
                 347          DATA    AC                                                V&103 00333
                 348          GOTO    FRMWR2                                            V&103 00334
                 349 FRMWR1   CONT                                                      V&103 00335
        000210 R 350 DS3      EQU     *                                                 V&103 00336
                 351 FRMWR2   CONT                                                      V&103 00337
                 352 DS31     FSTD                    STORE REDUCED ARG                 V&103 00338
000210 002000 A
000211 000172 E
000212 000325 R  353          DATA    DSF                                                     03 00339
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000213 005102 A  354            INCR    2          FLAG F.LT.1/2                    03 00340
                 355            IFT     VORTEX-1                                 D.103 00341
                 356            IFF     VORTEX-2                                 D.103 00342
                 357            GOTO    FRMWR1                                   D.103 00343
                 358            FLDD                                             V&103 00344
                 359            DATA    DSF                                      V&103 00345
                 360 FRMWR1     CONT                                             V&103 00346
000214 014110 A  361            LDA     DSF                                        03 00347
000215 144105 A  362            SUB     K200                                       03 00348
000216 001004 A  363            JAN     DS4        IS F.GE.1/2 ?                   03 00349
000217 000231 R
                 364            FSBD               YES, GET F-1                     V&103 00350
000220 002000 A
000221 000206 E
000222 000436 R  365            DATA    DSD1                                       03 00351
                 366            IFT     VORTEX-1                                 D.103 00352
                 367            IFF     VORTEX-2                                 D.103 00353
                 368            GOTO    FRMWR1                                   D.103 00354
                 369            FSTD                                             V&103 00355
                 370            DATA    AC                                       V&103 00356
                 371 FRMWR1     CONT                                             V&103 00357
000223 002000 A  372            CALL    $ZC        GET 1-F                         03 00358
000224 000000 E
                 373            IFT     VORTEX-1                                 D.103 00359
                 374            IFF     VORTEX-2                                 D.103 00360
                 375            GOTO    FRMWR1                                   D.103 00361
                 376            FLDD                                             V&103 00362
                 377            DATA    AC                                       V&103 00363
                 378 FRMWR1     CONT                                             V&103 00364
                 379            FSTD               STORE F                       V&103 00365
000225 002000 A
000226 000211 E
000227 000325 R  380            DATA    DSF                                        03 00366
000230 005002 A  381            TZB                FLAG F.GE.1/2                   03 00367
000231 064104 A  382 DS4        STB     DSFL+1     LOAD RANGE FLAG                 03 00368
                 383            IFT     VORTEX-1                                 D.103 00369
                 384            IFF     VORTEX-2                                 D.103 00370
                 385            GOTO    FRMWR1                                   D.103 00371
                 386            FLDD                                             V&103 00372
                 387            DATA    AC                                       V&103 00373
                 388 FRMWR1     CONT                                             V&103 00374
                 389            FMUD               GET F**2                      V&103 00375
000232 002000 A
000233 000000 E
000234 000325 R  390            DATA    DSF                                        03 00376
                 391            FSTD               STORE F**2 IN DSF2            V&103 00377
000235 002000 A
000236 000226 E
000237 000331 R  392            DATA    DSF2                                       03 00378
000240 005101 A  393            INCR    1                                          03 00379
000241 154073 A  394            ANA     DSFL       GET FLAG MOD 2                  03 00380
000242 144073 A  395            SUB     DSFL+1     COMPARE WITH RANGE FLAG         03 00381
000243 054072 A  396            STA     DSFL+1     SAVE SERIES FLAG                03 00382
000244 001010 A  397            JAZ     *+6        SINE SERIES ?                   03 00383
000245 000252 R
000246 006030 A  398            LDXI    DSST       YES, POINT X AT SINE TABLE      03 00384
000247 000352 R
000250 001000 A  399            JMP     *+4                                        07 00385
000251 000254 R
000252 006030 A  400            LDXI    DSCT       NO, POINT X AT COSINE TABLE     03 00386
000253 000406 R
000254 074005 A  401            STX     DSP1       LOAD TABLE POINTERS             03 00387
000255 074015 A  402            STX     DSP3                                       07 00388
000256 014045 A  403            LDA     KM6                                        03 00389
000257 054057 A  404            STA     DSLC       LOAD LOOP COUNT                 03 00390
                 405 ************************                                      03 00391
                 406 * EVALUATE POLYNOMIAL *                                      03 00392
                 407 ************************                                      03 00393
                 408            FLDD               GET LAST COEFFICIENT          V&103 00394
000260 002000 A
000261 000073 E
000262           409 DSP1       BSS     1                                          03 00395
                 410 DSL3       FMUD               GET ( ) **                    V&103 00396
000263 002000 A
000264 000233 E
000265 000331 R  411            DATA    DSF2                                       01 00397
000266 014004 A  412            LDA     DSP3                                       03 00398
000267 124032 A  413            ADD     K1         BUMP TABLE POINTER TO NEXT COEFFICIENT  03 00399
000270 054002 A  414            STA     DSP3                                       03 00400
                 415            FADD               GET (C+( )**)                 V&103 00401
000271 002000 A
000272 000000 E
000273           416 DSP3       BSS     1                                          03 00402
000274 044042 A  417            INR     DSLC       BUMP LOOP COUNT                 03 00403
000275 014041 A  418            LDA     DSLC                                       03 00404
000276 001004 A  419            JAN     DSL3       LOOP TILL DONE                  03 00405
000277 000263 R
000300 014035 A  420            LDA     DSFL+1                                     03 00406
000301 001010 A  421            JAZ     DSP4       SINE SERIES?                  V&103 00407
000302 000306 R
                 422            FMUD               YES, MULTIPLY BYF             V&103 00408
000303 002000 A
000304 000264 E
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000305 000325 R  423          DATA    DSF                                                    03 00409
000306 014026 A  424 DSP4     LDA     DSFL                                                V&103 00410
000307 006150 A  425          ANAI    2                                                      03 00411
000310 000002 A
                 426          IFT     VORTEX-1                                            D.103 00412
                 427          IFF     VORTEX-2                                            D.103 00413
                 428          GOTO    FRMWR1                                              D.103 00414
                 429          FSTD                                                        V&103 00415
                 430          DATA    AC                                                  V&103 00416
                 431 FRMWR1   CONT                                                        V&103 00417
000311 001010 A  432          JAZ     *+4         SIN/COS FLAG.GT.2 ?                        03 00418
000312 000315 R
000313 002000 A  433          CALL    $ZC         YES, FLIP SIGN                             03 00419
000314 000224 E
                 434 *********                                                               03 00420
                 435 * EXIT  *                                                               03 00421
                 436 *********                                                               03 00422
000315 014025 A  437          LDA     DSSA        RESTORE A                                  03 00423
000316 024025 A  438          LDB     DSSB        RESTORE B                                  03 00424
000317 034025 A  439          LDX     DSSX        RESTORE C                                  03 00425
000320 001000 A  440          JMP*    $DSI                                                   03 00426
000321 100043 R
                 441 ****************************                                          03 00427
                 442 * CONSTANTS AND VARIABLES *                                          03 00428
                 443 ****************************                                          03 00429
000322 000004 A  444 K4       DATA    4                                                      03 00430
000323 000200 A  445 K200     DATA    0200                                                   03 00431
000324 177772 A  446 KM6      DATA    -6                                                     03 00432
000325           447 DSF      BSS     4           F=FRACTIONAL PART                          03 00433
000331           448 DSF2     BSS     4           F**2                                       03 00434
000335           449 DSFL     BSS     2           SIN/COS FLAG                               03 00435
000337           450 DSLC     BSS     1           LOOP COUNTER                               03 00436
000340           451 DSMF     BSS     3           MASK FIELD                                 03 00437
000343           452 DSSA     BSS     1           SAVE A                                     03 00438
000344           453 DSSB     BSS     1           SAVE B                                     03 00439
000345           454 DSSX     BSS     1           SAVE X                                     03 00440
000346           455 DST      BSS     1           TEMP STORE                                 03 00441
         000325 R 456 DSU      EQU     DSF         ARGUMENT U                                 03 00442
                 457          IFT     $BIT-16                                                03 00443
                 458          GOTO    Z1                                                     03 00444
000347 077775 A  459 KM3      DATA    077775      16-BIT -3 COUNTER                          03 00445
000350 100000 A  460 DSHB     DATA    0100000     16-BIT SIGN BIT                            03 00446
000351 000055 A  461 DSSC     DATA    45          16-BIT MANTISSA LENGTH                     03 00447
000352 000150 A  462 DSST     DATA    0150        16-BIT S6=.56339 36132 27383 E-7           03 00448
000353 074374 A  463          DATA    074374                                                 03 00449
000354 071032 A  464          DATA    071032                                                 03 00450
000355 050631 A  465          DATA    050631                                                 03 00451
000356 000156 A  466          DATA    0156        16-BIT S5=-.35986 43370 61349 E-5          03 00452
000357 103477 A  467          DATA    0103477                                                03 00453
000360 007072 A  468          DATA    07072                                                  03 00454
000361 073571 A  469          DATA    073571                                                 03 00455
000362 000164 A  470          DATA    0164        16-BIT S4=.16044 11507 47150 E-3           03 00456
000363 052036 A  471          DATA    052036                                                 03 00457
000364 002773 A  472          DATA    02773                                                  03 00458
000365 021770 A  473          DATA    021770                                                 03 00459
000366 000171 A  474          DATA    0171        16-BIT S3=-.46817 54132 34162 E-2          03 00460
000367 131513 A  475          DATA    0131513                                                03 00461
000370 054634 A  476          DATA    054634                                                 03 00462
000371 027136 A  477          DATA    027136                                                 03 00463
000372 000175 A  478          DATA    0175        16-BIT S2=.79692 62624 60430 E-1           03 00464
000373 050632 A  479          DATA    050632                                                 03 00465
000374 074316 A  480          DATA    074316                                                 03 00466
000375 072607 A  481          DATA    072607                                                 03 00467
000376 000200 A  482          DATA    00200       16-BIT S1=-.64596 40975 06244              03 00468
000377 126521 A  483          DATA    0126521                                                03 00469
000400 074714 A  484          DATA    074714                                                 03 00470
000401 022676 A  485          DATA    022676                                                 03 00471
000402 000201 A  486 DSP2     DATA    0201        16-BIT S0=1.5707 96326 79490               03 00472
000403 062207 A  487          DATA    062207                                                 03 00473
000404 073250 A  488          DATA    073250                                                 03 00474
000405 042055 A  489          DATA    042055                                                 03 00475
000406 000153 A  490 DSCT     DATA    0153        16-BIT C6=.46552 98729 14909 E-6           03 00476
000407 076366 A  491          DATA    076366                                                 03 00477
000410 076021 A  492          DATA    076021                                                 03 00478
000411 006037 A  493          DATA    06037                                                  03 00479
000412 000161 A  494          DATA    0161        16-BIT C5=-.25200 13545 49175 E-4          03 00480
000413 113115 A  495          DATA    0113115                                                03 00481
000414 034076 A  496          DATA    034076                                                 03 00482
000415 042163 A  497          DATA    042163                                                 03 00483
000416 000166 A  498          DATA    0166        16-BIT C4=.91925 99500 95279 E-3           03 00484
000417 074175 A  499          DATA    074175                                                 03 00485
000420 017554 A  500          DATA    017554                                                 03 00486
000421 005015 A  501          DATA    05015                                                  03 00487
000422 000173 A  502          DATA    0173        16-BIT C3=-.20863 48073 49535 E-1          03 00488
000423 125213 A  503          DATA    0125213                                                03 00489
000424 074373 A  504          DATA    074373                                                 03 00490
000425 037731 A  505          DATA    037731                                                 03 00491
000426 000177 A  506          DATA    0177        16-BIT C2=.25366 95078 99865               03 00492
000427 040360 A  507          DATA    040360                                                 03 00493
000430 037020 A  508          DATA    037020                                                 03 00494
000431 015407 A  509          DATA    015407                                                 03 00495
000432 000201 A  510          DATA    0201        16-BIT C1=-1.2337 00550 13615              03 00496
000433 130413 A  511          DATA    0130413                                                03 00497
```

```
000434 074623 A   512          DATA    074623                                                  03 00498
000435 037105 A   513          DATA    037105                                                  03 00499
000436 000201 A   514 DSD1     DATA    0201          16-BIT C0=1                               03 00500
000437 040000 A   515          DATA    040000                                                  03 00501
000440 000000 A   516          DATA    0                                                       03 00502
000441 000000 A   517          DATA    0                                                       03 00503
                  518 Z1       CONT                                                          03 00504
                  519          IFT     $BIT-18                                               03 00505
                  520          GOTO    Z2                                                    03 00506
                  521 KM3      DATA    0377775       18-BIT -3 COUNTER                       03 00507
                  522 DSHB     DATA    0400000       18-BIT SIGN BIT                         03 00508
                  523 DSSC     DATA    51            18-BIT MANTISSA LENGTH                  03 00509
                  524 DSST     DATA    0150          18-BIT S6=.56339 36132 27383 5 E-7      03 00510
                  525          DATA    0361763                                               03 00511
                  526          DATA    0220652                                               03 00512
                  527          DATA    063160                                                03 00513
                  528          DATA    0156          18-BIT S5=-.35986 42370 61349 3 E-5     03 00514
                  529          DATA    0416377                                               03 00515
                  530          DATA    0161656                                               03 00516
                  531          DATA    0357123                                               03 00517
                  532          DATA    0164          18-BIT S4=.16044 11507 47149 9 E-3      03 00518
                  533          DATA    0250170                                               03 00519
                  534          DATA    057664                                                03 00520
                  535          DATA    0177020                                               03 00521
                  536          DATA    0171          18-BIT S3=-.46817 54132 34161 9 E-2     03 00522
                  537          DATA    0546455                                               03 00523
                  538          DATA    0314705                                               03 00524
                  539          DATA    0313577                                               03 00525
                  540          DATA    0175          18-BIT S2=.79692 62624 60430 4 E-1      03 00526
                  541          DATA    0243153                                               03 00527
                  542          DATA    0306356                                               03 00528
                  543          DATA    0260776                                               03 00529
                  544          DATA    0200          18-BIT S1=-.64596 40975 06244 3         03 00530
                  545          DATA    0532504                                               03 00531
                  546          DATA    0316304                                               03 00532
                  547          DATA    0267620                                               03 00533
                  548 DSP2     DATA    0201          18-BIT S0=1.5707 96326 79489 7          03 00534
                  549          DATA    0311037                                               03 00535
                  550          DATA    0265210                                               03 00536
                  551          DATA    0205506                                               03 00537
                  552 DSCT     DATA    0153          18-BIT C6=.46552 98729 14908 7 E-6      03 00538
                  553          DATA    0371733                                               03 00539
                  554          DATA    0340421                                               03 00540
                  555          DATA    0203732                                               03 00541
                  556          DATA    0161          18-BIT C5=-.25200 13545 49174 8 E-4     03 00542
                  557          DATA    0454466                                               03 00543
                  558          DATA    0301750                                               03 00544
                  559          DATA    0216364                                               03 00545
                  560          DATA    0164          18-BIT C4=.91925 99500 95279 1 E-3      03 00546
                  561          DATA    0360764                                               03 00547
                  562          DATA    0373301                                               03 00548
                  563          DATA    0101560                                               03 00549
                  564          DATA    0173          18-BIT C3=-.20863 48073 49535 2 E-1     03 00550
                  565          DATA    0525054                                               03 00551
                  566          DATA    0307667                                               03 00552
                  567          DATA    0373103                                               03 00553
                  568          DATA    0177          18-BIT C2=.25366 95078 99865 1          03 00554
                  569          DATA    0301701                                               03 00555
                  570          DATA    0360403                                               03 00556
                  571          DATA    0140741                                               03 00557
                  572          DATA    0201          18-BIT C1=-1.2337 00550 13615 1         03 00558
                  573          DATA    0542054                                               03 00559
                  574          DATA    0314467                                               03 00560
                  575          DATA    0310542                                               03 00561
                  576 DSD1     DATA    0201          18-BIT C0=1                             03 00562
                  577          DATA    0200000                                               03 00563
                  578          DATA    0                                                     03 00564
                  579          DATA    0                                                     03 00565
                  580 Z2       CONT                                                          03 00566
                  581 DSCFPP   CONT                                                          E.1 ********
                  582          IFT     VORTEX-1                                              E.1 ********
                  583          IFF     VORTEX-2                                              E.1 ********
                  584          GOTO    DSCFPP                                                E.1 ********
                  585          STB     DSSB                                                  E.1 ********
                  586          CMX     DSSX                                                  E.1 ********
                  587 ********************************************************************  E.1 ********
                  588 * COMPUTES SIN/COS BY FORCING X TO MODULAR PI/2 AND                  *  E.1 ********
                  589 * PERFORMING 7 ITERATIONS.                                           *  E.1 ********
                  590 ********************************************************************  E.1 ********
                  591 *                               A=1 FOR COS, 0 FOR SIN                E.1 ********
                  592 DS1      FSTD                   SAVE ARGUMENT                         E.1 ********
                  593          DATA    XVAL                                                 E.1 ********
                  594          STA     FLAG           SAVE SIN FLAG                         E.1 ********
                  595          LDA     XVAL+1         CONVERT NEGATIVE TO PLU               E.1 ********
                  596          JAP     SC030                                                E.1 ********
                  597          CPA                                                          E.1 ********
                  598          STA     XVAL+1                                               E.1 ********
                  599          LDA     FLAG           IS IT SIN                             E.1 ********
                  600          DAP                                                          E.1 ********
                  601          JAZ     SC030                                                E.1 ********
                  602          INR     FLAG           YES, SET FLAG TO TWO                  E.1 ********
                  603          INR     FLAG                                                 E.1 ********
                  604 ********************************************************************  E.1 ********
```

```
605 * INITIALLY FORCE X TO MODULAR PI/2 *                                E.1********
606 ***************************************                               E.1********
607 SC030   FLDD                                                         E.1********
608         DATA    XVAL                                                 E.1********
609         FDVD                    X/(PI/2)                             E.1********
610         DATA    PIOVR2                                               E.1********
611         FSTD                                                         E.1********
612         DATA    XSQR                                                 E.1********
613         FLDD                                                         E.1********
614         DATA    XSQR                                                 E.1********
615         FIX     MOD             FORCE INTEGER MODULAR                E.1********
616         LDA     MOD                                                  E.1********
617         CPA                                                          E.1********
618         IAR                                                          E.1********
619         STA     NEWX                                                 E.1********
620         FLT     NEWX            SEPARATE MANTISSA AND EXP            E.1********
621         FADD                                                         E.1********
622         DATA    XSQR                                                 E.1********
623         FSTD                                                         E.1********
624         DATA    NEWX                                                 E.1********
625 *****************                                                    E.1********
626 * SELECT OCTANT *                                                    E.1********
627 *****************                                                    E.1********
628         LDA     MOD             ONLY LEAST TWO BITS IMP              E.1********
629         ADD     FLAG                                                 E.1********
630         STA     FLAG                                                 E.1********
631         INCR    1                                                    E.1********
632         STA     MOD                                                  E.1********
633         LDA     NEWX                                                 E.1********
634         SUB     H200            IS NEW X .GE. 1/2                    E.1********
635         JAN     SC080                                                E.1********
636 ***************************************************                  E.1********
637 * INVERT ARGUMENT AND FUNCTION IF REQUESTED *                        E.1********
638 ***************************************************                  E.1********
639         TZA                     YES, INVERT ARGUMENT                 E.1********
640         STA     MOD                                                  E.1********
641         FLDD                                                         E.1********
642         DATA    DONE                                                 E.1********
643         FSBD                                                         E.1********
644         DATA    NEWX                                                 E.1********
645         FSTD                                                         E.1********
646         DATA    NEWX                                                 E.1********
647 *                               FIRST CALCULATE X**2                 E.1********
648 SC080   FLDD                                                         E.1********
649         DATA    NEWX                                                 E.1********
650         FMUD                                                         E.1********
651         DATA    NEWX                                                 E.1********
652         FSTD                                                         E.1********
653         DATA    XSQR                                                 E.1********
654         INCR    1                                                    E.1********
655         ANA     FLAG                                                 E.1********
656         SUB     MOD                                                  E.1********
657         STA     MOD                                                  E.1********
658         JANZ    SC090                                                E.1********
659 *********************************                                    E.1********
660 * PERFORM COSINE ITERATIONS *                                        E.1********
661 *********************************                                    E.1********
662         FLDD                                                         E.1********
663         DATA    XSQR                                                 E.1********
664         FMUD                                                         E.1********
665         DATA    COS7                                                 E.1********
666         FADD                                                         E.1********
667         DATA    COS6                                                 E.1********
668         FMUD                                                         E.1********
669         DATA    XSQR                                                 E.1********
670         FADD                                                         E.1********
671         DATA    COS5                                                 E.1********
672         FMUD                                                         E.1********
673         DATA    XSQR                                                 E.1********
674         FADD                                                         E.1********
675         DATA    COS4                                                 E.1********
676         FMUD                                                         E.1********
677         DATA    XSQR                                                 E.1********
678         FADD                                                         E.1********
679         DATA    COS3                                                 E.1********
680         FMUD                                                         E.1********
681         DATA    XSQR                                                 E.1********
682         FADD                                                         E.1********
683         DATA    COS2                                                 E.1********
684         FMUD                                                         E.1********
685         DATA    XSQR                                                 E.1********
686         FADD                                                         E.1********
687         DATA    COS1                                                 E.1********
688         JMP     SC100                                                E.1********
689 *********************************                                    E.1********
690 * PERFORM SIN ITERATIONS *                                           E.1********
691 *********************************                                    E.1********
692 SC090   FLDD                                                         E.1********
693         DATA    XSQR                                                 E.1********
694         FMUD                                                         E.1********
695         DATA    SIN7                                                 E.1********
696         FADD                                                         E.1********
697         DATA    SIN6                                                 E.1********
```

```
                    698          FMUD
                    699          DATA     XSQR
                    700          FADD
                    701          DATA     SIN5
                    702          FMUD
                    703          DATA     XSQR
                    704          FADD
                    705          DATA     SIN4
                    706          FMUD
                    707          DATA     XSQR
                    708          FADD
                    709          DATA     SIN3
                    710          FMUD
                    711          DATA     XSQR
                    712          FADD
                    713          DATA     SIN2
                    714          FMUD
                    715          DATA     XSQR
                    716          FADD
                    717          DATA     SIN1
                    718 SC100    LDA      MOD
                    719          JAZ      SC105
                    720          FMUD                MULTIPLY BY MANTISSA IF SIN
                    721          DATA     NEWX
                    722 SC105    FSTD
                    723          DATA     AC
                    724          LDXI     AC
                    725          LDA      FLAG       INVERT SIGN IF REQUIRED
                    726          ANAI     2
                    727          TAB
                    728          LDA      1,1
                    729          XBNZ     SC110
                    730          STA      1,1
                    731          LDA      DSSA       RESTORE A
                    732          LDB      DSSB       RESTORE B
                    733          LDX      DSSX       RESTORE X
                    734          JMP*     $DSI       EXIT
                    735 SC110    CPA
                    736 DSSA     BSS      1          INITIAL A
                    737 DSSB     BSS      1          INITIAL B
                    738 DSSX     BSS      1          INITIAL X
                    739 FLAG     BSS      1          1=INVERT RESULT SIGN
                    740 MOD      BSS      1
                    741 XVAL     EQU      *
                    742 NEWX     BSS      4          NEW X VALUE
                    743 XSQR     BSS      4          X**2
                    744 H200     DATA     0200
                    745 SIN7     DATA     0150,074374,071032,050631
                    746 SIN6     DATA     0156,0103477,07072,073571
                    747 SIN5     DATA     0164,052036,02773,021770
                    748 SIN4     DATA     0171,0131513,054634,027136
                    749 SIN3     DATA     0175,050632,074316,072607
                    750 SIN2     DATA     0200,0126521,074714,022676
                    751 PIOVR2   EQU      *
                    752 SIN1     DATA     0201,062207,073250,042055
                    753 COS7     DATA     0153,076366,076021,06037
                    754 COS6     DATA     0161,0113115,034076,042163
                    755 COS5     DATA     0166,074175,017554,05015
                    756 COS4     DATA     0173,0125213,074373,037731
                    757 COS3     DATA     0177,040360,037020,015407
                    758 COS2     DATA     0201,0130413,074623,037105
                    759 DONE     EQU      *
                    760 COS1     DATA     0201,040000,0,0
                    761 DSCFPP   CONT
                    762          END
ENTRY NAMES
000033 R $DCO    000043 R $DSI    000016 R DCOS    000000 R DSIN
EXTERNAL NAMES
000261 E $DLO    000055 E $DNO    000020 E $SE     000236 E $STO
000314 E $ZC     000272 E $ZK     000221 E $ZL     000304 E $ZM
000076 E $ZN     000000 E AC
SYMBOLS
000020 A $BIT    000033 R $DCO    000261 E $DLO    000055 E $DNO
000043 R $DSI    000020 E $SE     000236 E $STO    000314 E $ZC
000272 E $ZK     000221 E $ZL     000304 E $ZM     000076 E $ZN
000000 E AC      000037 R DC01    000016 R DCOS    000022 R DCP
000045 R DS01    000046 R DS1     000072 R DS2     000210 R DS3
000210 R DS31    000231 R DS4     000406 R DSCT    000436 R DSD1
000325 R DSF     000331 R DSF2    000335 R DSFL    000350 R DSHB
000000 R DSIN    000125 R DSL1    000131 R DSL2    000263 R DSL3
000337 R DSLC    000340 R DSMF    000004 R DSP     000260 R DSP1
000402 R DSP2    000273 R DSP3    000306 R DSP4    000342 R DSSA
000344 R DSSB    000351 R DSSC    000376 R BSST    000345 R DSSX
000346 R DST     000325 R DSU     000323 R K200    000322 R K4
000347 R KM3     000324 R KM6     000001 A VORTEX  000001 A X
   0 ERRORS ASSEMBLY COMPLETE

   164   $BIT      457    519
   196   $DCO       38    204
     0   $DLO       51     52
     0   $DNO       60    228
   211   $DSI       37    179    205    440    734
```

```
   0   $8E          69     70
   0   $STO         83     84
   0   $ZC          91    372    433
   0   $ZK          98     99
   0   $ZL         112    113
   0   $ZM         126    127
   0   $ZN         140    141
   0   AC           58    201    216    250    252    321    338    347    370
                   377    387    430    723    724
 760   COS1        687
 758   COS2        683
 757   COS3        679
 756   COS4        675
 755   COS5        671
 754   COS6        667
 753   COS7        665
 205   DC01        192
 184   DCOS         40    191
 187   DCP         189
 759   DONE        642
 219   DS01        180
 223   DS1         207
 242   DS2         231    236
 346   DS3         259    260
 352   DS31        345
 382   DS4         363
 581   DSCFPP      222    584
 490   DSCT        400
 514   DSD1        365
 447   DSF         353    359    361    380    390    423    456
 448   DSF2        255    256    269    277    311    324    325    327    328
                   330    331    333    341    392    411
 449   DSFL        223    234    237    238    312    313    382    394    395
                   396    420    424
 460   DSHB        272
 171   DSIN         39    178
   0   DSINCO       11
 277   DSL1        310
 283   DSL2        291
 410   DSL3        419
 450   DSLC        279    288    404    417    418
 451   DSMF        270    271    273    296    326    329    332
 174   DSP         176
 409   DSP1        401
 486   DSP2        245
 416   DSP3        402    412    414
 424   DSP4        421
 452   DSSA        177    190    203    218    437    731
 453   DSSB        224    438    585    732
 461   DSSC        264    266
 462   DSST        398
 454   DSSX        225    439    586    733
 455   DST         267    306    308
 456   DSU         227    229    230    233    243
 739   FLAG        594    599    602    603    629    630    655    725
  54   FRMWR1       50     68     82     97    111    125    139    199    214
                   249    319    336    344    357    368    375    385    428
  56   FRMWR2       53     71     85    100    114    128    142    348
 744   H200        634
 445   K200        257    362
 444   K4          413
 459   KM3         278
 446   KM6         403
 740   MOD         615    616    628    632    640    656    657    718
 742   NEWX        619    620    624    633    644    646    649    651    721
   0   P           151    157
 751   PIOVR2      610
 607   SC030       596    601
 648   SC080       635
 692   SC090       658
 718   SC100       688
 722   SC105       719
 735   SC110       729
 752   SIN1        717
 750   SIN2        713
 749   SIN3        709
 748   SIN4        705
 747   SIN5        701
 746   SIN6        697
 745   SIN7        695
   1   VORTEX       48     49     66     67     80     81     95     96    109
                   110    123    124    137    138    197    198    212    213
                   220    221    247    248    317    318    334    335    342
                   343    355    356    366    367    373    374    383    384
                   426    427    582    583
 166   X           283    284    286    292    297    298    300    301    302
                   304    305
 743   XSQR        612    614    622    653    663    669    673    677    681
                   685    693    699    703    707    711    715
 741   XVAL        593    595    598    608
 518   Z1          458
 580   Z2          520
```

```
000001 A     1 VORTEX SET     1                                                                  04 00001
             2 *   THIS IS A COPYRIGHTED PROGRAM. COPYRIGHT 1973 BY VARIAN DATA MACHINE         04 00002
             3 *                                                                                04 00003
             4 *    V.D.M.   PART  NO.          92L0506-157C                                    04 00004
             5 *                                                                                04 00005
             6 *                                          RELEASE      10-15-73                 04 00006
             7 *                                                                                04 00007
             8 *                 IDINT                                                          04 00008
             9 *                                                                                04 00009
            10 *                                                                                04 00010
            11          TITLE   IDINT                                                          04 00011
            12 *        CALL    $DIT,ARG        A=INTEGER PART OF ARG                          04 00012
            13 *                                                                               04 00013
            14          NAME    $DIT,IDINT                                                     04 00014
            16 **********                                                                      04 00016
            17 * MACRO *                                                                       04 00017
            18 **********                                                                      04 00018
            19 FSE      MAC                                                                    04 00019
            20          IFT     VORTEX-2                                                    D.104 00020
            21          IFF     VORTEX-4                                                    D.104 00021
            22          GOTO    FRMWR1                                                      D.104 00022
            23          EXT     $SE                                                         D.104 00023
            24          CALL    $SE             XFER PARAMETERS                             D.104 00024
            25          GOTO    FRMWR2                                                      D.104 00025
            26 FRMWR1   CONT                                                                D.104 00026
            27          DATA    0105036         BCS XFER PARAMETERS                         D.104 00027
            28 FRMWR2   CONT                                                                D.104 00028
            29          EMAC                                                                   04 00029
     000003 A   31 INC    SET     3                                                              ********
            32          IFF     VORTEX-1                                                       ********
     000004 A   33 INC    SET     INC+1                                                          ********
            34          IFF     VORTEX-3                                                       ********
            35 INC      SET     INC+1                                                          ********
            36          EXT     $DMD                                                           04 00031
     000001 A   37 X      EQU     1                                                              04 00032
000000          38 DIT1   BSS     0                                                              04 00033
000000 074046 A 39        STX     DITG                                                           04 00034
000001 064046 A 40        STB     DITG+1                                                         04 00035
000002 034035 A 41        LDX     $DIT+INC                                                       ********
000003 074002 A 42        STX     DITQ                                                           04 00037
000004 002000 A 43        CALL    $DMD,0                                                         04 00038
000005 000000 E
000006 000000 A
000006          44 DITQ   BES     0                                                              04 00039
000007 015000 A 45        LDA     0,X             EXPONENT OF ARGUMENT.                          04 00040
000010 144040 A 46        SUB     DITB                                                           04 00041
000011 005002 A 47        TZB                                                                    04 00042
000012 054037 A 48        STA     DITS                                                           04 00043
000013 001004 A 49        JAM     DIT5                                                           04 00044
000014 000025 R
000015 124035 A 50        ADD     DITL                                                           04 00045
000016 054005 A 51        STA     DITA                                                           04 00046
000017 015001 A 52        LDA     1,X                                                            04 00047
000020 001002 A 53        JAP     DITA                                                           04 00048
000021 000024 R
000022 064027 A 54        STB     DITS                                                           04 00049
000023 005211 A 55        CPA                                                                    04 00050
000024 004441 A 56 DITA   LLRL    1               MODIFIED SHIFT.                                04 00051
000025          57 DIT5   BSS     0                                                              04 00052
000025 005021 A 58        TBA                                                                    04 00053
000026 024023 A 59        LDB     DITS                                                           04 00054
000027 001020 A 60        JBZ     DIT7                                                           04 00055
000030 000043 R
000031          61 DIT6   BSS     0                                                              04 00056
000031 034015 A 62        LDX     DITG                                                           04 00057
000032 024015 A 63        LDB     DITG+1                                                         04 00058
000033 001000 A 64        JMP*    $DIT            RETURN                                         04 00059
000034 100034 R
000034          65 $DIT   BES     0               ENTRY                                          04 00060
000034          66 IDINT  BES     0                                                              04 00061
                67        ESE                     XFER PARAMETERS                                04 00062
000035 002000 A
000036 000000 E
000037 000001 A 68        DATA    1,0                                                            04 00063
000040 000000 A
000041 001000 A 69        JMP     DIT1                                                           04 00064
000042 000000 R
000043          70 DIT7   BSS     0                                                              04 00065
000043 005211 A 71        CPA                                                                    04 00066
000044 005111 A 72        IAR                                                                    04 00067
000045 001000 A 73        JM*     DIT6                                                           04 00068
000046 000031 R
                74 *      TERMS   FOR $DIT                                                       04 00069
000047          75 DITG   BSS     2                                                              04 00070
000051 000200 A 76 DITB   DATA    0200                                                           04 00071
000052          77 DITS   BSS     1                                                              04 00072
000053 004441 A 78 DITL   LLRL    1                                                              04 00073
000054          79 DITM   BSS     8                                                              04 00074
                80        END                                                                    04 00075
ENTRY NAMES
000034 R $DIT   000034 R IDINT
EXTERNAL NAMES
000005 E $DMD   000036 E $SE
```

```
SYMBOLS
000034 R $DIT    000005 E $DNO    000036 E $SE     000000 R DIT1
000025 R DIT5    000031 R DIT6    000043 R DIT7    000024 R DITA
000051 R DITB    000047 R DITG    000053 R DITL    000054 R DITM
000006 R DITQ    000052 R DITS    000034 R IDINT   000004 A INC
000001 A VORTEX  000001 A X
  0 ERRORS ASSEMBLY COMPLETE

   65  $DIT       14     41     64
    0  $DNO       36     43
    0  $SE        23     24
   38  DIT1       69
   57  DIT5       49
   61  DIT6       73
   70  DIT7       60
   56  DITA       51     53
   76  DITB       46
   75  DITG       39     40     62     63
   78  DITL       50
   44  DITQ       42
   77  DITS       48     54     59
   26  FRMWR1     22
   28  FRMWR2     25
   66  IDINT      11     14
   31  INC        33     35     41
    1  VORTEX     20     21     32     34
   37  X          45     52
```

```
                    1  *THIS IS A COPYRIGHTED PROGRAM.COPYRIGHT 1974 BY VARIAN DATA MACHINE     00  00001
                    2  *                                                                        00  00002
                    3  *  V.D.M.  PART  NO.    92L1709-003A                                    00  00003
                    4  *                                                                        00  00004
                    5  *                                                                     E.2*********
                    6  *                                                                        00  00006
                    7  *                                                                        00  00007
                    8  *       THE FOLLOWING ARE SUPPLEMENTAL OPCODES                           00  00008
                    9  *       FOR USE WITH THE MICRO ASSEMBLER                                 00  00009
                   10  *                                                                        00  00010
                   11  *                                                                        00  00011
0009               12  ADD     EQU     9                                                       00  00012
0008               13  ALUC    EQU     8                                                       00  00013
0006               14  ALUO    EQU     6                                                       00  00014
0007               15  ALUS    EQU     7                                                       00  00015
0009               16  ALUZ    EQU     9                                                       00  00016
000B               17  AND     EQU     X'B                                                     00  00017
0002               18  AOVC    EQU     2                                                       00  00018
0002               19  AOVCS   EQU     2                                                    E.2*********
0001               20  AZERO   EQU     1                                                       00  00019
0000               21  A$GPR   EQU     0                                                       00  00020
0002               22  A$GPRL  EQU     2                                                       00  00021
0003               23  A$GPRR  EQU     3                                                       00  00022
0001               24  A$P     EQU     1                                                       00  00023
0000               25  A$SPEC  EQU     0                                                       00  00024
0007               26  B0$ALU  EQU     7                                                       00  00025
000F               27  B0$MIR  EQU     X'F                                                     00  00026
0003               28  B0$OVR  EQU     3                                                       00  00027
000B               29  B0$P    EQU     X'B                                                     00  00028
0000               30  B$GPR   EQU     0                                                       00  00029
0001               31  B$SPEC  EQU     1                                                       00  00030
0003               32  CRY1    EQU     3                                                       00  00031
000F               33  DECA    EQU     X'F                                                     00  00032
0009               34  DECB    EQU     9                                                       00  00033
0004               35  DECODE  EQU     4                                                       00  00034
0005               36  DECOD$  EQU     5                                                       00  00035
0006               37  EOR     EQU     6                                                       00  00036
0003               38  FT      EQU     3                                                       00  00037
0001               39  GPROUT  EQU     1                                                       00  00038
000D               40  GPRS    EQU     X'D                                                     00  00039
0001               41  IBR$I   EQU     1                                                       00  00040
0004               42  IF$ALU  EQU     4                                                       00  00041
000C               43  IF$MIR  EQU     X'C                                                     00  00042
0000               44  IF$OVR  EQU     0                                                       00  00043
0008               45  IF$P    EQU     8                                                       00  00044
0000               46  INCA    EQU     0                                                       00  00045
0001               47  INCB    EQU     1                                                       00  00046
0004               48  INCP    EQU     4                                                       00  00047
0005               49  INCSC   EQU     5                                                       00  00048
0002               50  IOR     EQU     2                                                       00  00049
0001               51  IOSR    EQU     1                                                       00  00050
0006               52  KOUT    EQU     6                                                       00  00051
0000               53  LFT     EQU     0                                                       00  00052
0003               54  LIT     EQU     3                                                       00  00053
0001               55  LOG     EQU     1                                                       00  00054
0001               56  MEMC    EQU     1                                                       00  00055
0002               57  MEMC$   EQU     2                                                       00  00056
0001               58  MIR     EQU     1                                                       00  00057
0008               59  MIRS    EQU     X'B                                                     00  00058
0002               60  MSK     EQU     2                                                       00  00059
000E               61  NORM    EQU     X'E                                                     00  00060
0000               62  NOTA    EQU     0                                                       00  00061
0005               63  NOTB    EQU     5                                                       00  00062
0005               64  OF$ALU  EQU     X'5                                                     00  00063
000D               65  OF$MIR  EQU     X'D                                                     00  00064
0001               66  OF$OVR  EQU     1                                                       00  00065
0003               67  OF$P    EQU     3                                                       00  00066
0005               68  OLOOP   EQU     5                                                       00  00067
0000               69  ONES    EQU     0                                                       00  00068
0000               70  OPR     EQU     0                                                       00  00069
0003               71  OPROUT  EQU     3                                                       00  00070
0001               72  OR      EQU     1                                                       00  00071
0004               73  OSC     EQU     4                                                       00  00072
0006               74  OSCF    EQU     6                                                       00  00073
0006               75  OVF$ALU EQU     6                                                       00  00074
0002               76  OVF$MIR EQU     X'E                                                     00  00075
0000               77  OVR     EQU     0                                                       00  00076
0004               78  P       EQU     4                                                       00  00077
0000               79  PA      EQU     0                                                       00  00078
0003               80  PJMP    EQU     3                                                       00  00079
0004               81  PJMP$   EQU     4                                                       00  00080
0001               82  PONEL   EQU     1                                                       00  00081
0004               83  PONJMP  EQU     4                                                       00  00082
0001               84  POUT    EQU     1                                                       00  00083
0002               85  PUSH    EQU     2                                                       00  00084
0005               86  PUSH$   EQU     X'5                                                     00  00085
0001               87  R1      EQU     1                                                       00  00086
0002               88  R2      EQU     2                                                       00  00087
0004               89  R4      EQU     4                                                       00  00088
0005               90  R5      EQU     5                                                       00  00089
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                      0006  94  R6      EQU     6                                              00 00093
                      0007  95  R7      EQU     7                                              00 00094
                      0008  96  R8      EQU     8                                              00 00095
                      0009  97  R9      EQU     9                                              00 00096
                      000A  98  RA      EQU     X'A                                            00 00097
                      000B  99  RB      EQU     X'B                                            00 00098
                      000C 100  RC      EQU     X'C                                            00 00099
                      000D 101  RD      EQU     X'D                                            00 00100
                      000E 102  RE      EQU     X'E                                            00 00101
                      000F 103  RF      EQU     X'F                                            00 00102
                      0001 104  RGHT    EQU     1                                              00 00103
                      0004 105  ROVFL   EQU     4                                            E.2*******
                      0002 106  SCOUT   EQU     2                                              00 00104
                      000C 107  SFTC    EQU     X'C                                            00 00105
                      000C 108  SHFA    EQU     X'C                                            00 00106
                      000A 109  SHFT    EQU     X'A                                            00 00107
                      0001 110  SHFTOP  EQU     1                                              00 00108
                      0002 111  SOVFL   EQU     2                                            E.2*******
                      0000 112  SPEC    EQU     0                                              00 00109
                      0004 113  SSW1    EQU     4                                              00 00110
                      0003 114  SSW2    EQU     3                                              00 00111
                      0002 115  SSW3    EQU     2                                              00 00112
                      000D 116  STACK   EQU     X'D                                            00 00113
                      0003 117  STAT    EQU     3                                              00 00114
                      0006 118  SUB     EQU     6                                              00 00115
                      0002 119  S$ALU   EQU     2                                              00 00116
                      0006 120  S$OVFL  EQU     6                                              00 00117
                      0008 121  S$OVF$  EQU     8                                            E.2*******
                      0001 122  S$SHFT  EQU     1                                              00 00118
                      0002 123  TCB     EQU     2                                              00 00119
                      0003 124  TESTT   EQU     3                                              00 00120
                      0002 125  TESTF   EQU     2                                              00 00121
                      0005 126  TFIR    EQU     5                                              00 00122
                      000F 127  TRNA    EQU     X'F                                            00 00123
                      000A 128  TRNB    EQU     X'A                                            00 00124
                      0002 129  TT      EQU     2                                              00 00125
                      0001 130  WAITMD  EQU     1                                              00 00126
                      0003 131  ZERO    EQU     3                                              00 001
                           133  *                                                              00 00
                           134  *       FOLLOWING ARE ROM STANDARD STATE ADDRESSES             00 00.
                           135  *                                                              00 00131
                      013E 136  SS1M    EQU     X'13E       RESTART PIPELINE @ P               00 00132
                      0092 137  SS2M    EQU     X'092       MAINTAIN PIPELINE                  00 00133
                      002D 138  SS3M    EQU     X'02D       DECODE NEXT INSTRUCTION (IN IBR)   00 00134
0000                       140          ALOC    0                                              00 00136
                           141  *                                                              00 00137
                           142  * INITIALIZE ALL ENTRY POINTS                                  00 00138
0000 0490000180000000      143          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00139
0001 0490000180000000      144          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00140
0002 0490000180000000      145          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00141
0003 0490000180000000      146          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00142
0004 0490000180000000      147          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00143
0005 0490000180000000      148          GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)               00 00144
0006 0490000180000000      149             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00145
0007 0490000180000000      150             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00146
0008 0490000180000000      151             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00147
0009 0490000180000000      152             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00148
000A 0490000180000000      153             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00149
000B 0490000180000000      154             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00150
000C 0490000180000000      155             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00151
000D 0490000180000000      156             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00152
000E 0490000180000000      157             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00153
000F 0490000180000000      158             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00154
0010 0490000180000000      159             GEN     /P(SS2M),10(PJMP),1(0),5(0),5(0)            00 00155
0011 0490000180000000      160             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00156
0012 0490000180000000      161             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00157
0013 0490000180000000      162             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00158
0014 0490000180000000      163             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00159
0015 049000018000000C      164             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00160
0016 0490000180000000      165             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00161
0017 0490000180000000      166             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00162
0018 0490000180000000      167             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00163
0019 0490000180000000      168             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00164
001A 0490000180000000      169             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00165
001B 0490000180000000      170             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00166
001C 0490000180000000      171             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00167
001D 0490000180000000      172             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00168
001E 0490000180000000      173             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00169
001F 0490000180000000      174             GEN     /P(SS2M),10(PJMP),1(0),6(0),5(0)            00 00170
0020                       175          ORG     X'20                                           00 00171
0020 00000006E0000004      176  COMPOP  GEN     IMD,LB3,AA4                 COMMON POP/RETURN  00 00172
                           177  *                                                              00 00173
                           178  *                                                              00 00174
                           179  *       SINGLE PRECISION FIXED DIVIDE (DIV)                    00 00175
                           180  *                                                              00 00
                           181  *       CALLING SEQUENCE                                       00 00
                           182  *                                                              00 00178
                           183  *       AR0/AR1=DIVIDEND                                       00 00179
                           184  *       ARC    =DIVISOR                                        00 00180
                           185  *                                                              00 00181
                           186  *       RETURN                                                 00 00182
                           187  *                                                              00 00183
                           188  *       AR0    =REMAINDER                                      00 00184
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                        189  *        AR1      =QUOTIENT                                               00 00185
                        190  *                                                                         00 00186
0021 0110000000A900FE   191  DIV2     GEN      /*,FFA,MF1,BBF,AAE,WR1                                  00 00187
0022 21282280002701FF   192           GEN      /T(DIV5,DIV4),TF2,GFA,FF2,CF3,WR1,SH1,BBF,AAF           00 00188
0023 01A8008000260110   193  DIV18    GEN      /N(DIV18A),GF2,RF3,FF2,CF3,SH1,BB1   NOT B TO OPREG     00 00189
0024 0178000003000001   194  DIV4     GEN      /N(DIV7),RF3,AA1                     B TO OPREG         00 00190
0025 0118000010010001   195  DIV5     GEN      /N(DIV18),LA2,WR1,AA1                                   00 00191
                        196  DIV1     GEN      /T(DIV5,DIV4),TF2,GFA,FF2,                              00 00192
0026 21282280002701FE   197                    CCF3,WR1,SH1,BBF,AAE                                    00 00193
0027 0100000020A90001   198  DIV16    GEN      /N(COMPOP),LB1,FFA,MF1,WR1,AA1      OPREG TO AR1        00 00194
                        199  *                                                SAMPLE SIGN              00 00195
0028 0150048000000000   200  DIV9     GEN      /N(DIV10),SF1,GF2                   SET OVERFLOW        00 00196
                        201  DIV7A    GEN      /T(DIV10,DIV9),TF2,GFD,LB3,RF2,     SET -DIVIDE COUNT   00 00197
0029 4150234062A000E0   202                    CFFA,BBE                                                00 00198
                        203  DIV10    GEN      /T(DIV19,DIV10),TF2,GFC,MR1,LA2,    SHIFT/ADD/INCREMENT 00 00199
002A 51602320159192F0   204                    CFF9,WR1,SC1,XF2,SH2,BBF,RF5        COUNT TILL DONE     00 00200
002B 3108230000004000   205  DIV0     GEN      /T(DIV2,DIV1),TF2,GFF,VF1           TEST SIGN           00 00201
002C 016800804 0A00000  206  DIV19    GEN      /*,GF2,LB2,FFA                      (HERE ON ZERO COUNT) 00 00202
002D 2198234000000000   207           GEN      /T(DIV12,DIV13),TF2,GFD             TEST SIGN OF REMAINDER 00 00203
002E 0100000020270101   208  DIV17    GEN      /N(COMPOP),LB1,FF2,CF3,WR1,SH1,AA1  NOT PPREG TO AR1    00 00204
                        209  DIV7     GEN      /N(DIV7A),GF2,FF9,WR1,SC1,XF2,                          00 00205
002F 01480080009190E0   210                    CBBE,AA0                            ARE + AR0           00 00206
0030 0158000000A920CF   211  DIV      GEN      /N(DIV0),FFA,MF1,WR1,BBC,AAF,WF1    MOVE DIVISOR/       00 00207
                        212  DIV14    GEN      /T(DIV16,DIV17),TF2,GFF,FF2,CF3,    COMPLEMENT AR0/TEST 00 00208
0031 713823C000270100   213                    CWR1,SH1                            SIGN OF DIVISOR     00 00209
0032 713833C000000000   214  DIV15    GEN      /T(DIV16,DIV17),TF3,GFF             TEST SIGN OF DIVISOR 00 00210
0033 01A00000009100F0   215  DIV12    GEN      /*,FF9,WR1,BBF,AA0                  ADD DIVISOR TO IT   00 00211
0034 1188228000000000   216  DIV13    GEN      /T(DIV14,DIV15),TF2,GFA             TEST SIGN OF DIVIDEND 00 00212
0035 017800000023A100   217  DIV18A   GEN      /N(DIV7),FF2,CF1,WR1,SC1,WF1,SH1    SHIFT OPREG RIGHT   00 00213
                        218  *                                                                         00 00214
                        219  *        SINGLE PRECISION FIXED MULTIPLY (MUL)                            00 00215
                        220  *                                                                         00 00216
                        221  *                                                                         00 00217
                        222  *        CALLING SEQUENCE                                                 00 00218
                        223  *                                                                         00 00219
                        224  *        AR1      =MULTIPLIER                                             00 00220
                        225  *        AR0      =MULTIPLICAND                                           00 00221
                        226  *                                                                         00 00222
                        227  *        RETURN                                                           00 00223
                        228  *                                                                         00 00224
                        229  *        AR0/AR1=PRODUCT                                                  00 00225
                        230  *                                                                         00 00226
                        231  MUL8     GEN      /T(MUL9,*),TF2,GFC,MR1,LA3,RF5,FF9,                     00 00227
0036 31F823201D91A800   232                    CWR1,SC1,WF1,XF1                                        00 00228
0037 05880080009000F1   233  MUL1     GEN      /N(MUL2),GF2,FF9,BBF,AA1                                00 00229
0038 01E0000013004001   234  MUL4     GEN      /N(MUL5),LA2,RF3,VF1,AA1                                00 00230
                        235  MCTOSB   GEN      /N(MCTOS3),10(WAITMD),6(SPEC),FFB,12(A$SPEC), RC=R8-1   00 00231
0039 05180000 80B1028C  236                    C11(B$GPR),23(R8),22(ADNE),17(GPROUT),24(RC)            00 00232
                        237  FAULT    GMSK     /N(FAULTA),10(DS$ALU),6(MEMC),12(A$GPX),      LOC OF BCS 00 00233
003A 05280403619FFFCD   238                    C16(RD),11(LIT),MKFFFC,14(ADD),13(POUT)          E.2********
003B 01E00200009000F1   239  MUL3     GEN      /N(MUL5),GF8,FF9,BBF,AA1            SAMPLE OVERFLOW     00 00235
003C 01E800000039000F   240  MUL5     GEN      /N(MUL6),FF3,MF1,WR1,AAE            ZERO OUT ARE        00 00236
003D 01F000200000A800   241  MUL6     GEN      /*,MR1,SC1,WF1,XF1                                      00 00237
003E 01B000200591A800   242           GEN      /N(MUL8),MR1,RF5,FF9,WR1,SC1,XF1,WF1                    00 00238
003F 020000001801A800   243  MUL9     GEN      /*,LA3,WR1,SC1,WF1,XF1                                  00 00239
                        244           GEN      /T(MUL12,MUL13),TF2,GFA,LB1,FFA,    TEST PRODUCT SIGN   00 00240
0040 1218228020A90001   245                    CMF1,WR1,AA1                                            00 00241
0041 0580000000A900CF   246  MUL      GEN      /N(MULA),FFA,MF1,WR1,BBC,AAF        MOVE MULTIPLICAND   00 00242
0042 0100000018010401   247  MUL13    GEN      /N(COMPOP),LA3,WR1,SH4,AA1                              00 00243
0043 02100000096700F0   248  MUL12    GEN      /N(MUL13),FF6,CF3,WR1,BBF                               00 00244
                0044    249  ADDR1    EQU      *                                                       00 00245
001A                    251           ORG      X'1A                                                    00 00254
                        252  *                 WAIT FOR MEMORY COMPLETE                                00 00255
001A 0278000080000000   253           GEN      /N(FLOAD),6(SPEC),10(WAITMD)                            0  00256
                        254  *                 WAIT FOR MEMORY COMPLETE                                00 00257
001B 02A8000080000000   255           GEN      /N(FSTOR),6(SPEC),10(WAITMD)                            00 00258
001D                    256           ORG      X'1D                                                    00 00259
001D 0310000084000000   257  $DO      GEN      /N(YFO1),10(WAITMD),5(SPEC),13(INCP)                    00 00260
                        258  * FOLLOWING IS BCS ENTRY POINT-                                           00 00261
001E 02F8000080000000   259           GEN      /N(DOSE1),6(SPEC),10(WAITMD)                            00 00262
                        260  *                 WAIT FOR MEMORY COMPLETE                                00 00263
001F 02C8000080000000   261           GEN      /N(FMOVE),6(SPEC),10(WAITMD)                            00 00264
                        262  *                                                                         00 00265
                        263  *                                                                         00 00266
                        265  *                                                                         00 00268
                        266  *                                                                         00 00269
                        267  * ROUTINE TO FETCH PARAMETERS FOR SUBROUTINE INTERFACE                    00 00270
                        268  *                                                                         00 00271
                        269  *        CALLING SEQUENCE'                                                00 00272
                        270  *        BSS      1             SUBROUTINE ENTRY POIN                     00 00273
                        271  *        BCS      X'8A1E        WCS CALL                                  00 00274
                        272  *        DATA     NUMBER OF PARAMETER ADDRESSES                           00 00275
                        273  *        BSS      N             STORAGE FOR ADDRESSES                     00 00276
                        274  * NOTE' INDIRECTS ARE RESOLVED                                            00 00277
                        275  *                                                                         00 00278
                        276  * THE CALLING PROGRAM MUST CALL A SUBROUTINE AS FOLLOWS                   00 00279
                        277  *        CALL     SUB           SUBROUTINE CALL                           00 00280
                        278  *        DATA     A,B,C,...     PARAMETER ADDRESSES TO BE PASSED          00 00281
                        279  *                                  (MAY BE INDIRECT)                      00 00282
                        280  *                                                                         00 00283
                        281  * FORTSE PASSES PARAMETER ADDRESSES FROM THE CALLING PROGRAM TO           00 00284
                        282  * THE SUBROUTINE AND SETS A PROPER RETURN ADDRESS                         00 00285
                        283  *                                                                         00 00286
```

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                           *                                                              00 00287
                           *                                                              00 00288
0044                                ORG     ADDR1                                         00 00289
                           *                SET MOVE AMOUNT IN SHIFT COUNT                00 00290
                           FORTSE GEN       /*,11(B$SPEC),23(MIR),12(A$SPEC),22(AZERO),14(SUB),   00 00291
0044 0228000022660110                       C16(CRY1),13(SCOUT)                           00 00292
                           * WAIT FOR MEMORY                                              00 00293
0045 0230000080000000               GEN     /*,6(SPEC),10(WAITMD)                         00 00294
                           * SET UP FROM PARAMETER ADDRESS                                00 00295
                                    GEN     /N(FORTS1),11(B$SPEC),23(MIR),14(DECB),17(GPROUT),   00 00296
0046 0240000020910219                       C24(R9),12(A$SPEC),22(AONE)                 E.2*******
                           * RETURN TO NORMAL MICRO CONTROL                               00 00298
                           FORTS4 GEN       /N(FORTS7),10(IF$P),12(A$GPR),24(R9),14(INCA),   E.2*******
0047 0300040404070009                       C16(CRY1),6(MEMC),13(INCP),17(GPROUT)         00 00300
                           * FETCH FROM PARAMETER (OR INDIRECT ADDRESS)                   00 00301
                           FORTS1 GEN       /*,10(OF$ALU),12(A$GPR),24(R9),14(INCA),16(CRY1),   E.2*******
0048 0248040280070009                       C17(GPROUT),6(MEMC)                           00 00303
0049 0250040680000000      FORTS2 GEN       /N(FORTS9),6(MEMC),10(OF$MIR)                 00 00304
                           * STORE PARAMETER (DUMMY IF INDIRECT)                          00 00305
                           FORTS9 GEN       /N(FORTS8),11(B$SPEC),23(MIR),17(GPROUT),     00 00306
004A 0388008020A90018                       C24(R8),14(TRNB),15(LOG),5(0),6(0),7(S$ALU)   00 00307
                           *                COMPLETE DATA STORAGE AND INCREMENT MOVE COUNT   00 00308
                           FORTS5 GEN       /N(FORTS6),12(A$GPR),24(R8),14(TRNA),15(LOG),   00 00309
004B 0268000080F80008                       C6(SPEC),10(WAITMD)                           00 00310
                           *                STORE VALUE                                   00 00311
                           FORTS3 GEN       /N(FORTS5),10(DS$P),6(MEMC),13(INCP),12(A$GPR),   00 00312
004C 0258040504F80008                       C24(R8),14(TRNA),15(LOG)                      00 00313
                           *                STORE RETURN IF COMPLETE/FETCH NEXT IF NOT    00 00314
                           FORTS6 GEN       /T(FORTS4,FORTS1),5(TT),7(SFTC),10(DS$ALU),6(TESTT),   00 00315
                                            C11(B$SPEC),23(OPR),14(TRNB),15(LOG),13(INCSC),   00 00316
004D 42382F0325A80009                       C12(A$GPR),24(R9)                           E.2*******
                           *                                                              00 00318
                           *                                                              00 00319
                           *                                                              00 00321
                           *                                                              00 00322
                           *                                                              00 00323
                           * ROUTINE TO LOAD DOUBLE WORD FROM MEMORY TO REGISTER A (R0)   00 00324
                           * AND B (R1)                                                   00 00325
                           *                                                              00 00
                           *        CALLING SEQUENCE:                                     00 00
                           *        BCS      '8A1A                                        00 00328
                           *        ADDRESS OF DOUBLE WORD (MAY BE MULTI LEVEL INDIRECT)  00 00329
                           *                                                              00 00330
                           *        RETURN                                                00 00331
                           *        TWO WORDS IN A (R0) AND B (R1)                        00 00332
                           *                                                              00 00333
                           *                FETCH SECOND WORD                             00 00334
                           FLOAD2 GEN       /N(FLOAD3),10(OF$ALU),12(A$GPR),24(R0),14(INCA),   00 00335
004E 0288040280060000                       C16(CRY1),6(MEMC)                             00 00336
                           *                FETCH CONTENTS OR FETCH NEXT INDIRECT LEVEL   00 00337
004F 0280040680000000      FLOAD  GEN       /N(FLOAD1),10(OF$MIR),6(MEMC)                 00 00338
                           *                SAVE ADDRESS AND LOOP IF INDIRECT             00 00339
                           FLOAD1 GEN       /T(FLOAD,FLOAD2),5(TT),11(B$SPEC),23(MIR),14(TRNB),   00 00340
0050 727822C020A90010                       C15(LOG),7(MIRS),17(GPROUT),24(R0)            00 00341
                           *                SAVE FIRST WORD                               00 00342
                           FLOAD3 GEN       /*,11(B$SPEC),23(MIR),14(TRNB),15(LOG),       00 00343
0051 0290000020A90010                       C17(GPROUT),24(R0)                            00 00344
                           *                WAIT TIL MEMORY DONE AND SAVE PC              00 00345
0052 0298000084000000               GEN     /*,6(SPEC),10(WAITMD),13(INCP)                00 00346
                           *                STORE 2ND WORD AND RESTART THE PIPELINE       00 00347
                                    GEN     /N(SS2M),7(PJMP$),1(0),5(0),6(MEMC$),10(IF$P),   00 00348
0053 0490090420A90011                       C11(B$SPEC),23(MIR),14(TRNB),15(LOG),17(GPROUT),24(R1)   00 00349
                           *                                                              00 00350
                           *                                                              00 00351
                           *                                                              00 00352
                           *                                                              00 00353
                           *                                                              00 00354
                           * ROUTINE TO STORE DOUBLE WORD                                 00 00355
                           *                                                              00 00356
                           *        CALLING SEQUENCE:                                     00 00357
                           *        DOUBLE WORD IN A (R0) AND B (R1)                      00 00358
                           *        BCS      '8A1B                                        00 00359
                           *        ADDRESS TO STORE DOUBLE WORD (MAY BE MULTILEVEL INDIRECT)   00 00360
                           *                                                              00 00361
                           *        RETURN                                                00 00362
                           *        DOUBLE WORD STORED                                    00 00363
                           *                                                              00 00364
                           *                COMPLETE R0 (A) STORAGE                       00 00365
                           FSTOR2 GEN       /N(FSTOR3),12(A$GPR),24(R0),14(TRNA),15(LOG),   00 00366
0054 02B8000080F80000                       C6(SPEC),10(WAITMD)                           00 00367
                           *                FETCH ADDRESS TO STORE (IF MULTILEVEL INDIRECT)   00 00368
0055 02B0040680000000      FSTOR  GEN       /N(FSTOR1),10(OF$MIR),6(MEMC)                 00 00369
                           *                STORE A (R0) OR LOOP ON INDIRECT              00 00370
                           FSTOR1 GEN       /T(FSTOR,FSTOR2),5(TT),7(MIRS),10(DS$DVR),6(TESTF),   00 00371
0056 22A82AC100F80000                       C12(A$GPR),24(R0),14(TRNA),15(LOG)            00 00
                           *                STORE B (R1)                                  00 00
                           FSTOR3 GEN       /*,10(DS$ALU),11(B$SPEC),23(MIR),14(INCB),16(CRY1),   00 003
0057 02C0040320160110                       C12(A$SPEC),22(AZERO),6(MEMC)                 00 00375
                           *                COMPLETE STORAGE AND RESTART PIPELINE         00 00376
                                    GEN     /N(FSTOR4),10(IF$P),6(MEMC),13(INCP),12(A$GPR),   00 00377
0058 0308040404F80001                       C24(R1),14(TRNA),15(LOG)                      00 00378
                           *                                                              00 00379
                           *                                                              00 00380
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                         *
                         *
                         *
                         * ROUTINE TO PERFORM MEMORY TO MEMORY DOUBLE WORD MOVE
                         *
                         *        CALLING SEQUENCE:
                         *        BCS      '8A1F
                         *        ADDRESS OF SOURCE (MAY BE MULTILEVEL INDIRECT)
                         *        ADDRESS OF TARGET (MAY BE MULTILEVEL INDIRECT)
                         *
                         *        RETURN
                         *        A (R0) AND B (R1) ARE DESTROYED, DOUBLE WORD IS STORED
                         *
                         *                FETCH CONTENTS OR INDIRECT ADDRESS
0059 02D8040600000000    FMOVE  GEN      /N(FMOVE1),10(OF$MIR),6(MEMC)
                         *                FETCH SECOND WORD
                         FMOVE2 GEN      /N(FMOVE3),10(OF$ALU),6(MEMC),12(A$GPR),24(R0),
005A 02E0040200060000                    C14(INCA),16(CRY1)
                         *                SAVE ADDRESS AND LOOP IF INDIRECT
                         FMOVE1 GEN      /T(FMOVE,FMOVE2),5(TT),7(MIRS),11(B$SPEC),23(MIR),
005B 520822C000A90010                    C14(TRNB),15(LOG),17(GPROUT),24(R0)
                         *                SAVE MSW IN A (R0)
                         FMOVE3 GEN      /*,11(B$SPEC),23(MIR),14(TRNB),15(LOG),17(GPROUT),
005C 02E8000020A90010                    C24(R0)
                         *                FETCH STORAGE ADDRESS
005D 02F0040484000000           GEN      /*,10(OF$P),6(MEMC),13(INCP)
                         *                SAVE MSW IN B (R1) AND GO STORE A (R0) AND B (R1)
                                GEN      /N(FSTOR),11(B$SPEC),23(MIR),14(TRNB),15(LOG),
005E 02A80000F0A90011                    C17(GPROUT),24(R1)
                         *
                         *
                         *
                         *
                         *
                         * FETCH INPUT PARAMETERS ADDRESS
                         DOSE1  GMSK     /N(FORTSE),6(MEMC),10(OF$ALU),12(A$P),11(LIT),
005F 02200402E8900010                    C15(0001),14(ADD),13(DPROUT)
                         FORTS7 GEN      /P(SS3M),10(IF$P),12(A$GPR),24(R9),14(TRNA),
0060 01680F0404F80009                    C15(LOG),7(PJMP$),1(0),5(0),6(MEMC$),13(INCP)
                         FSTOR4 GEN      /N(SS3M),7(PJMP$),1(0),5(0),6(MEMC$),10(IF$P),
0061 0168090404F80001                    C13(INCP),12(A$GPR),24(R1),14(TRNA),15(LOG)
                         *
                         *                DO LOOP TERMINATOR ROUTINE FOR V74 FIRMWARE
                         *                      REPLACES $DO
                         *
                         *                  CALLING SEQUENCE:
                         *
                         *                BCS $DOF
                         *                DATA  INCREMENT
                         *                DATA  VALUE
                         *                DATA  LIMIT
                         *                DATA  RETURN
                         *
                         *                  VALUE = VALUE + INCREMEND
                         *                  IF VALUE GREATER THAN OR EQUAL TO LIMIT
                         *                     CONTROL IS RETURNED TO INSTRUCTION
                         *                     AFTER "DATA RETURN", OTHERWISE CONTROL
                         *                     IS TRANSFERRED TO RETURN
                         *
                         *                AS PART OF PIPELINE MIR = ADDRESS OF INCREMENT
                         *                     START GETTING INCREMENT
                         *
                         *           SAVE INCREMENT IN RF, GET VALUE
                         *
                         YDO1   GEN      /N(YDO2),10(OF$MIR),6(MEMC),11(B$SPEC),23(MIR),
0062 03800406A0A9001C                    C14(TRNB),13(LOG),17(GPROUT),24(RF)
                         *
                         *           TEST INDIRECT CHAIN-$DO IF MORE, OTHERWISE GET INCREMENT
                         *
                         DO3    GEN      /N(VALUX),10(OF$P),11(B$SPEC),23(MIR),14(TRNB),15(LOG),
0063 0328040[illegible]A0A9001F                    C17(GPROUT),24(RF),6(MEMC)
0064 1318310980000000    $DO1   GEN      /T(DO3,YDO1),5(FT),7(ALUD),10(WAITMD),6(SPEC)
                         *
                         *           GET VALUE INTO MIR, VALUE ADDRESS IN ALU
                         *
0065 0338000080000000    VALUX  GEN      /N(VALUE),10(WAITMD),6(SPEC)
                         *
                         *           PUT NEW VALUE BACK
                         *
                         VAL2   GEN      /N(VAL3),10(OF$ALU),6(MEMC),12(A$GPR),24(RF),
0066 0340040304A800EF                    C11(B$GPR),[illegible](RE),14(TRNA),15(LOG),13(INCP)
                         VALUE  GEN      /T(VALUX,VAL2),10(OF$MIR),6(MEMC),7(MLRS),5(TT),
0067 33282606A0A9001E                    C23(MIR),14(TRNB),15(LOG),17(GPROUT),24(RE),11(B$SPEC)
                         VAL3   GEN      /N(LIMIT),12(A$GPR),24(RF),11(B$SPEC),23(MIR),
0068 03480404A091001F                    C14(ADD),17(GPROUT),10(OF$P),6(MEMC)
                         *
                         *           GET LIMIT
                         *
0069 0358000080000000    LIMIT  GEN      /N(LIM1),6(SPEC),10(WAITMD)
                         LIM2   GEN      /N(LIM3),10(OF$P),12(A$GPR),24(RF),14(DECA),
006A 0368040484F1000F                    C17(GPROUT),6(MEMC),13(INCP)
006B 5348060080000000    LIM1   GEN      /T(LIMIT,LIM2),5(TT),10(OF$MIR),7(MLRS),6(MEMC)
                         *
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                       474   *           IF VALUE LT LIMIT RETURN                                          00  00477
                       475   *                                                                             00  00478
006C 737831C080000000  476   LIM4    GEN      /T(NEXT,RETURN),5(FT),7(ALUS),10(WAITMD),6(SPEC)             00  00479
                       477   LIM3    GEN      /N(LIM4),12(A$GPR),24(RF),11(B$SPEC),23(MIR),14(SUB),        00  00480
006D 036000802067001F  478                    C17(GPROUT),16(CRY1),5(0),6(0),7(S$ALU)                      00  00481
                       479   RETURN  GEN      /N(SS2M),7(PJMP$),1(0),10(IF$MIR),11(B$SPEC),23(MIR),        00  00482
006E 04900906F1A80010  480                    C14(TRNB),15(LOG),13(POUT),6(MEMC$)                          00  00483
J06F 0490090404000000  481   NEXT    GEN      /N(SS2M),7(PJMP$),1(0),10(IF$P),6(MEMC$),13(INCP)            00  00484
                       482   YDO2    GEN      /N($DO1),11(A$GPR),24(RC),14(TRNA),15(LOG),                  00  00485
0070 0320008000F9000C  483                    C17(GPROUT),5(0),6(0),7(S$ALU)                               00  00406
0071 624821C000000000  484   FORTS8  GEN      /T(FORTS2,FORTS3),5(TT),7(ALUS)                              00  00487
                 0072  485   ADDR2   EQU      *                                                            00  00488
                       487   *                                                                             00  00490
                       488   *                                                                             00  00491
                       489   *           MUST BE ASSEMBLED WITH SUPPLEMENTAL OPCODE EQUATE DECK            00  00492
                       490   *                                                                             00  00493
                       491   *                                                                             00  00494
                 0200  492   P       EQU      X'200                                   PAGE 1 ADDRESS       00  00495
0019                   493           ORG      X'19                                                         00  00496
                       494   STACKS  GEN      /N(STACK1),12(A$P),14(DECA),          SAVE PROGRAM COUNTER   00  00497
0019 03B8000088F10009  495                    C15(000),17(GPROUT),24(R9),10(WAITMD),6(SPEC)                00  00498
                       496   *                                                                             00  00499
0072                   497           ORG      ADDR2                                                        00  00500
                       498   *                                                                             00  00501
                       499   INCR0B  GEN      /N(INCTOS),                                                  00  00502
                       500                    C11(B$SPEC),23(MIR),14(TRNB),15(LOG),     TRANSFER MIR       00  00503
0072 04F0000020A90010  501                    C17(GPROUT),24(R0)                           TO GPR          00  00504
0073 0548040280000008  502   INCLR1  GEN      /N(INCR1A),10(OF$ALU),6(MEMC),24(R8)                         00  00505
                       503   INCR1B  GEN      /N(INCTOS),                                                  00  00506
                       504                    C11(B$SPEC),23(MIR),14(TRNB),15(LOG),     TRANSFER MIR       00  00507
0074 04F0000020A90011  505                    C17(GPROUT),24(R1)                           TO GPR          00  00508
0075 0540040280000008  506   INCLRB  GEN      /N(INCRBA),10(OF$ALU),6(MEMC),24(R8)                         00  00509
                       507   INCRBB  GEN      /N(INCTOS),                                                  00  00510
                       508                    C11(B$SPEC),23(MIR),14(TRNB),15(LOG),     TRANSFER MIR       00  00511
0076 04F0000020A9001B  509                    C17(GPROUT),24(RB)                           TO GPR          00  00512
                       510   STACK1  GEN      /T(STACK3,STACK2),5(FT),7(MIRS),    SAVE STACK CONTROL BLK00  00513
                       511                    C11(B$SPEC),17(GPROUT),24(RD),       PTR IN 'P', TEST FORE.2*********
0077 43C832C020A9001D  512                    C23(MIR),14(TRNB),15(LOG)             INDIRECT ADDRESS       00  00515
0078 00C8040685000000  513   STACK2  GEN      /N(STACKS),10(OF$MIR),6(MEMC),13(INCSC) INDIRECT,TRY NEXT00  005
0079 0558040680000000  514   STACK3  GEN      /N(STACK5),10(OF$MIR),6(MEMC)       GET TOP OF STACK PTR   00  0
                       515   STACK4  GEN      /F(SADD),FS9,2(X'7),11(B$SPEC),23(MIR), SAVE PTR IN R8       00  005
007A 043A400020A90018  516                    C14(TRNB),15(LOG),17(GPROUT),24(R8)  FIELD SLELCT 5-7        00  00519
                       517   *                                                                             00  00520
                       518   *                                                                             00  00521
007B 0560040480000000  519   SADD3   GEN      /N(SADDA),10(OF$P),6(MEMC)                FETCH NEXT DATA    00  00522
                       520   SADD4   GEN      /N(SADD5),11(B$SPEC),23(MIR),14(TRNB),   TRANSFER DATA TO   00  00523
007C 03E8000020A9001A  521                    C15(LOG),17(GPROUT),24(RA)                  RA               00  00524
                       522   SADD5   GEN      /N(SADD6),10(OS$P),6(MEMC),12(A$GPR),24(RB),                 00  00525
007D 03F00585009100AB  523                    C14(ADD),11(B$GPR),23(RA),17(GPROUT),5(0),7(S$OVFL)          00  00526
007E 0488000080F8000B  524   SADD6   GEN      /N(SEXIT),10(WAITMD),12(A$GPR),24(RB),14(TRNA),15(LOG)       00  00527
                       525   *                STORE RESULT OF RA + RB                                      00  00528
                       526   *                                                                             00  00529
007F 0568040480000000  527   SSUB3   GEN      /N(SSUBA),10(OF$P),6(MEMC)                FETCH NEXT DATA    00  00530
                       528   *                                                                             00  00531
                       529   *                                                                             00  00532
                       530   *                                                                             00  00533
0080 13A80006E00027B2  531   SADD    GMSK     /P(INCLRB+P),IMD,LB3,15(SADD3+P),AK2      INCR STACK PTR     00  00534
0081 13A80006E00027F2  532   SSUB    GMSK     /P(INCLRB+P),IMD,LB3,15(SSUB3+P),AK2      INCR STACK PTR     00  00535
0082 13980006E00028A2  533   SMUL    GMSK     /P(INCLR1+P),IMD,LB3,15(SMUL3+P),AK2      INCR STACK PTR     00  00536
0083 15380006E0002952  534   SDIV    GMSK     /P(INCLR0+P),IMD,LB3,15(SDIV5+P),AK2                         00  00537
0084 14E80006E00029A2  535   PUSHS   GMSK     /P(DECTOS+P),IMD,LB3,15(PUSH1+P),AK2      DECR TOP OF STACK00  00538
0085 14E80006E0002992  536   PUSHD   GMSK     /P(DECTOS+P),IMD,LB3,15(PUSHD1+P),AK2     DECR TOP OF STACK00  00539
0086 15380006E0002912  537   POP     GMSK     /P(INCLR0+P),IMD,LB3,15(SEXIT+P),AK2      INCR STACK PTR     00  00540
0087 15380006E0002882  538   POPD    GMSK     /P(INCLR0+P),IMD,L23,15(POPDA+P),AK2      INCR STACK PTR     00  00541
0088 13980006E0002912  539   POPDA   GMSK     /P(INCLR1+P),IMD,LB3,15(SEXIT+P),AK2      INCR STACK PTR     00  00542
                       540   *                                                                             00  00543
                       541   *                                                                             00  00544
                       542   SSUB4   GEN      /N(SADD5),12(A$SPEC),22(AZERO),11(B$SPEC),                   00  00545
0089 03E800002027011A  543                    C23(MIR),14(TCB),16(CRY1),17(GPROUT),24(RA)                  00  00546
                       544   SMUL3   GEN      /N(SMUL4),10(OF$P),6(MEMC),11(B$GPR),23(R0),                 00  00547
008A 0458040480A90003  545                    C14(TRNB),15(LOG),17(GPROUT),24(R3)                          00  00548
                       546   SMUL4   GEN      /N(SMUL6),10(WAITMD),6(SPEC),14(ZERO),                       00  00549
008B 0460000080390000  547                    C15(LOG),17(GPROUT),24(R0)                                   00  00550
                       548   SMUL6   GEN      /N(SMUL7),11(B$SPEC),23(MIR),14(TRNB),   RF = MULTIPLICAND00  00551
008C 0468000020A9001F  549                    C15(LOG),17(GPROUT),24(RF)                                   00  00552
008D 15800006E00028E2  550   SMUL7   GMSK     /P(MULA+P),IMD,LB3,15(SMUL8+P),AK2    MULTIPLY SUBROUTINE00  00553
                       551   SMUL8   GEN      /N(SMUL9),12(A$GPR),24(R8),14(TRNA),                         00  00554
008E 0478040300F80008  552                    C15(LOG),10(OS$ALU),6(MEMC)                                  00  00555
008F 0480000080F80001  553   SMUL9   GEN      /N(SMUL12),12(A$GPR),24(R1),14(TRNA),15(LOG),10(WAITMD)      00  00556
0090 14E80006E0002922  554   SMUL12  GMSK     /P(DECTOS+P),IMD,LB3,15(SMUL13+P),AK2     DECR TOP OF STACK00  00557
                       555   SEXIT   GMSK     /P(SS2M),10(IF$ALU),7(PJMP$),             PROG CNTR = 99+1   00  00558
                       556                    C6(MEMC$),12(A$GPR),AK9,                   FETCH NEXT INSTR00  00559
0091 04900908619FFFD9  557                    C13(POUT),11(LIT),14(ADD),MKFFD                              00  00560
                       558   SMUL13  GEN      /N(SMU13A),10(OS$P),6(MEMC),11(B$GPR),                       00  00561
0092 0498040500A900A1  559                    C23(RA),14(TRNB),15(LOG),17(GPROUT),24(R1)                   00  00562
0093 04A0000080F80000  560   SMU13A  GEN      /N(SMU14),12(A$GPR),21(R0),14(TRNA),15(LOG),10(WAITMD)       00  00563
                       561   SMU14   GEN      /N(SEXIT),11(B$GPR),23(RB),14(TRNB),15(LOG),                 00  00564
0094 0488000000A900B0  562                    C17(GPROUT),24(R0)                                           00  00565
                       563   *                                                                             00  00566
                       564   *                                                                             00  00567
0095 13980006E0002962  565   SDIV5   GMSK     /P(INCLR1+P),IMD,LB3,15(SDIV8+P),AK2      INCR STACK PTR     00  00568
0096 0570040280000008  566   SDIV8   GEN      /N(SDIVY),10(OF$ALU),6(MEMC),24(R8)                          00  00569
                       567   SDIV9   GEN      /N(SDIV10),11(B$SPEC),23(MIR),14(TRNB),  RF =  DIVISOR       00  00570
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0097 04C0000020A9001C 568                C15(LOG),17(GPROUT),24(RC)                                      00 00571
0098 11800006E00028E2 569  SDIV10 GMSK    /P(DIV+P),IMD,LB3,15(SMUL8+P),AK2                              00 00572
                      570  *                                                                             00 00573
                      571  *                                                                             00 00574
                      572  PUSHD1 GEN     /M(PUSH5),10(DS$ALU),6(MEMC),12(A$GPR),   STORE R1 ON TO       00 00575
0099 04E0040300F80008 573                C24(R8),14(TRNA),15(LOG)                 TOP OF STACK         00 00576
                      574  *                                                                             00 00577
                      575  *                                                                             00 00578
                      576  PUSH1  GEN     /N(PUSH2),10(DS$ALU),6(MEMC),12(A$GPR), STORE R0 ONTO TOP00 00579
009A 04D8040300F80008 577                C24(R8),14(TRNA),15(LOG)                 OF STACK             00 00580
009B 0488000080000000 578  PUSH2  GEN     /N(SEXIT),10(WAITMD)                                           00 00581
009C 0420000030F80001 579  PUSH5  GEN     /N(PUSHS),AA1,10(WAITMD),14(TRNA),15(LOG)                      00 00582
                      580  *                                                                             00 00583
                      581  *                                                                             00 00584
                      582  DECTOS GEN     /N(MCTOS),12(A$GPR),                   CTOS=CTOS+1, STORE 00 00585
009D 04F8000000F10008 583                C24(R8),14(DECA),17(GPROUT)                                     00 00586
                      584  INCTOS GEN     /N(MCTOS),12(A$GPR),                   CTOS=CTOS+1, STORE 00 00587
009E 04F8000000070008 585                C24(R8),14(INCA),16(CRY1),17(GPROUT)                            00 00588
009F 050004030100000D 586  MCTOS  GEN     /N(MCTOSX),10(DS$ALU),6(MEMC),24(RD),13(POUT)            E.2********
                      587  MCTOSX GEN     /N(MCTOSA),10(DF$P),6(MEMC),13(INCP), READ STACK LO LIMIT00 00590
00A0 0578040434F80008 588                CBB0,AA8,14(TRNA),15(LOG)                HOLD ALU             00 00591
                      589  MCTOS1 GEN     /N(MCTOS2),12(A$GPR),24(R8),11(B$SPEC), CTOS-(LO LIMIT)-100 00592
00A1 0510008020660018 590                C23(MIR),14(SUB),16(3),5(0),6(0),7(S$ALU)               ALU00 00593
                      591  MCTOS2 GEN     /T(MCTOSB,FAULT),10(DF$P),6(MEMC), READ HI LIMIT, GO TO  00 00594
00A2 51C835C484000000 592                C13(INCP),5(FT),7(ALUS)                  "FAULT" IF CTOS<LO LIM00 00595
                      593  MCTOS3 GEN     /N(MCTOS4),12(A$GPR),24(RC),11(B$SPEC), CTOS-(HI LIMIT)   00 00596
00A3 052000802060001C 594                C23(MIR),14(SUB),16(0000),5(0),6(0),7(S$ALU)                    00 00597
                      595  MCTOS4 GEN     /T(COMPOP,FAULT),5(TT),7(ALUZ),12(A$GPR),     TEST HI LIM 00 00598
00A4 D10021C001F80008 596                C24(R8),14(TRNA),15(LOG),13(POUT)                               00 00599
                      597  *                                                                             00 00600
                      598  FAULTA GEN     /N(FAULT1),12(A$GPR),10(WAITMD),                               00 00601
00A5 0530000080F80009 599                C24(R9),14(TRNA),15(LOG)                                        00 00602
00A6 09F00006E4900014 600  FAULT1 GEN     /P(SS1M),IMD,LB3,AA4,DB1,RF4            BRANCH/DELETE        00 00603
                      601  *                                                                             00 00604
00A7 0550040280000008 602  INCLR0 GEN     /N(INCR0A),10(DF$ALU),6(MEMC),24(R8)                          00 00605
00A8 03B0000080000000 603  INCRBA GEN     /N(INCRBB),10(WAITMD),6(SPEC)                                  00 00606
                      604  INCR1A GEN     /N(INCR1B),10(WAITMD),6(SPEC),                                 00 00607
00A9 03A00000803A9001A 605               C11(B$GPR),23(R1),14(TRNB),15(LOG),17(GPROUT),24(RA)            00 00608
                      606  INCR0A GEN     /N(INCR0D),10(WAITMD),6(SPEC),                                 00 00609
00AA 0390000080A9000B 607                C11(B$GPR),23(R0),14(TRNB),15(LOG),17(GPROUT),24(RB)            00 00610
00AB 03D0000080000000 608  STACK5 GEN     /N(STACK4),10(WAITMD),6(SPEC)                                  00 00611
00AC 03E0000080000000 609  SADDA  GEN     /N(SADD4),10(WAITMD),6(SPEC)                                   00 00612
00AD 0448000080000000 610  SSUBA  GEN     /N(SSUB4),10(WAITMD),6(SPEC)                                   00 00613
00AE 04B8000080000000 611  SDIVY  GEN     /N(SDIV9),10(WAITMD),6(SPEC)                                   00 00614
00AF 0508000080000000 612  MCTOSA GEN     /N(MCTOS1),10(WAITMD),6(SPEC)                                  00 00615
                      613  MULA   GMSK    /T(MUL1,MUL4),TF3,CFD,LB3,RF2,FFA,   SET SHIFT COUNTER         00 00616
00B0 41B8334062A000E0 614                CMK000E                                                         00 00617
00B1 61D8224013004001 615  MUL2   GEN     /T(MUL3,MUL5),TF2,CF9,LA2,RF3,VF1,AA1                          00 00618
                 00B2 616  ADDR3  EQU     *                                                              00 00619
                      618  *                                                                             00 00621
                      619  *                                                                             00 00622
                      620  *      MOVE BYTE STRING                                                       00 00623
                      621  *                                                                             00 00624
                      622  *      CALL:        DATA   0105070                                            00 00625
                      623  *                                                                             00 00626
                      624  *      ON ENTRY:  B REG - BYTE POINTER TO SOURCE                              00 00627
                      625  *                 X REG - BYTE POINTER TO DESTINATION                         00 00628
                      626  *                 A REG - NUMBER OF BYTES TO BE MOVED                         00 00629
                      627  *                                                                             00 00630
                      628  *                                                                             00 00631
                      629  *      FOLLOWING IS BCS ENTRY POINT - BIT 5 = 0 FOR CBS, = 1 FOR MBS          00 00632
0018                  630         ORG    X'18                                                            00 00633
0018 170A400000000000 631         GEN    /F(CBS),FS9,2(1)                                                00 00634
00B2                  632         ORG    ADDR3                                                           00 00635
                      633  *      SET ALU FLAGS FROM BYTE NUMBER OF DEST PTR.  JUMP ON SOURCE BYTE       00 00636
                      634  MBS4   GMSK    /F(MBS2),FS2,2(1),12(A$GPR),16(R2),11(LIT),15(X'FFFE),         00 00637
00B2 25888080600BFFFE2 635                C14(AND),7(S$ALU)                                              00 00638
                      636  *      DEC SOURCE ADDR.  PUT IT IN P.  SET BYTE FLAG FROM SOURCE PTR.         00 00639
00B3 0590000019F00401 637  MBS1   GEN     /N(MBS4),12(A$GPRR),24(R1),22(4),14(DECA),13(POUT)             00 00640
                      638  *      MBS2-MBS3 IS A 2-WORD TABLE WHICH MUST START ON AN EVEN ADDRESS        00 00641
                      639  *      SELECT ROUTINE - L TO L, L TO R, R TO R OR R TO L BYTE MOVE            00 00642
                      640  MBS2   GEN     /T(MBS5,MBS20),5(TT),12(A$GPR),24(R2),14(DECA),               00 00643
00B4 35B8224000F10002 641                C17(GPROUT),7(ALUZ)                                             00 00644
                      642  MBS3   GEN     /T(MBS9,MBS14),5(FT),12(A$GPR),24(R2),14(DECA),               00 00645
00B5 65D8324000F10002 643                C17(GPROUT),7(ALUZ)                                             00 00646
                      644  *                                                                             00 00647
                      645  *                                                                             00 00648
                      646  *      INITIATE WORD FETCH FOR L TO R MOVE.  FINISH PREVIOUS STORE.           00 00649
                      647  MBS20  GEN     /N(MBS21),10(DF$P),6(MEMC),11(B$SPEC),23(DALZ),          E.2********
00B6 06600404A4A80070 648                C14(TRNB),15(LOG),13(INCP)                                      00 00651
                      649  *                                                                             00 00652
                      650  *      START L TO L BYTE MOVE - FETCH A WORD, FINISH PREVIOUS BYTE STORE      00 00653
                      651  MBS5   GEN     /N(MBS6),10(DF$P),6(MEMC),11(B$SPEC),23(MIR),14(TRNB),         00 00654
00B7 05C00404A4A80010 652                C15(LOG),13(INCP)                                               00 00655
                      653  *      DECREMENT BYTE COUNT                                                   00 00656
00B8 05C8008000F10000 654  MBS6   GEN     /N(MBS7),12(A$GPR),24(R0),14(DECA),17(GPROUT),7(S$ALU)         00 00657
                      655  *      INCREMENT DEST PTR.  TEST FOR DONE - LOOP OR RETURN.                   00 00658
                      656  MBS7   GEN     /T(MBS8,MBS24),5(FT),7(ALUZ),12(A$GPR),24(R2),14(INCA),        00 00659
00B9 364031C080070002 657                C16(CRY1),17(GPROUT),6(SPEC),10(WAITMD)                         00 00660
                      658  *      INITIATE L TO R BYTE STORE                                             00 00661
                      659  MBSR5  GEN     /N(MBS15),10(BS$ALU),6(MEMC),12(A$GPRR),24(R2),22(4),          00 00662
00BA 067004039 8F80402 660                C14(TRNA),15(LOG)                                              00 00663
                      661  *                                                                             00 00664
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                         *                                                                      00 00665
                         *      START R TO R STRING MOVE - FETCH A WORD                         00 00666
00BB 05E8040484000000    MBS9   GEN    /N(MBS11),10(OF$P),6(MEMC),13(INCP)                      00 00667
                         *      START R TO L BYTE MOVE - FETCH A WORD                           00 00668
00BC 0648040484000000    MBS14  GEN    /N(MBS16),10(OF$P),6(MEMC),13(INCP)                      00 00669
                         *      DECREMENT BYTE COUNT                                            00 00670
00BD 05F0008000F10000    MBS11  GEN    /N(MBS12),12(A$GPR),24(R0),14(DECA),17(GPROUT),7(S$ALU)  00 00671
                         *      INCREMENT DESTINATION PTR.  TEST FOR DONE - LOOP OR RETURN.     00 00672
                         MBS12  GEN    /T(MBS13,MBS24),5(FT),7(ALUS),12(A$GPR),24(R2),          00 00673
00BE 363831C080070002                  C14(INCA),16(CRY1),17(GPROUT),6(SPEC),10(WAITMD)         00 00674
                         *      FINISH L TO L BYTE STORE                                        00 00675
                         MBS10  GEN    /N(MBS11),11(B$SPEC),23(MIR),14(TRNB),15(LOG),           00 00676
00BF 05E80000A0A80010                  C6(SPEC),10(WAITMD)                                      00 00677
                         *                                                                      00 00678
                         *                                                                      00 00679
                         *                                                                      00 00680
                         *      CBS4 IS A 4-WORD TABLE WHICH MUST START AT AN ADDR DIV BY X'10  00 00681
                         *      START LOOP FETCH WORD FROM STRING1 IF FIRST-READ OR IF L BYTE   00 00682
                         CBS4   GEN    /N(CBS5),10(OF$ALU),6(MEMC),12(A$GPRR),24(R1),22(4),     00 00683
00C0 06D8040298F80401                  C14(TRNA),15(LOG)                                        00 00684
00C1 06E8000000070001           GEN    /N(CBS7),12(A$GPR),24(R1),14(INCA),16(CRY1),17(GPROUT)   00 00685
                                GEN    /N(CBS5),10(OF$ALU),6(MEMC),12(A$GPRR),24(R1),22(4),     00 00686
00C2 06D8040298F80401                  C14(TRNA),15(LOG)                                        00 00687
                                GEN    /N(CBS5),10(OF$ALU),6(MEMC),12(A$GPRR),24(R1),22(4),     00 00688
00C3 06D8040298F80401                  C14(TRNA),15(LOG)                                        00 00689
                         *                                                                      00 00690
                         *      TRANSFER DATA WORD TO OPERAND REG FOR BYTE SHIFT                00 00691
00C4 05D0000023A80010    MBS23  GEN    /N(MBS25),11(B$SPEC),23(MIR),14(TRNB),15(LOG),13(OPROUT) 00 00692
                         *      TRANSFER SOURCE WORD TO OPERAND REG FOR BYTE SHIFT              00 00693
00C5 0658000023A80010    MBS18  GEN    /N(MBS19),11(B$SPEC),23(MIR),14(TRNB),15(LOG),13(OPROUT) 00 00694
                         *                                                                      00 00695
                         *      RESTORE P FROM R9 AND RETURN                                  E.2*******
                         MBS24  GEN    /P(SS2M),10(PJMP),12(A$GPR),24(R9),14(TRNA),15(LOG),   E.2*******
00C6 0490000181F80009                  C13(POUT)                                              E.2*******
                         *      INITIATE R TO R BYTE STORE                                      00 00699
                         MBS13  GEN    /N(MBS5),10(BS$ALU),6(MEMC),12(A$GPRR),24(R2),22(4),     00 00700
00C7 05B8040398F80402                  C14(TRNA),15(LOG)                                        00 00701
                         *      INITIATE L TO L BYTE STORE                                      00 00[illegible]
                         MBS8   GEN    /N(MBS10),10(BS$ALU),6(MEMC),12(A$GPRR),24(R2),22(4),    00 00[illegible]
00C8 05F8040398F80402                  C14(TRNA),15(LOG)                                        00 00[illegible]
                         *      DECREMENT BYTE COUNT                                            00 00705
00C9 0650008000F10000    MBS16  GEN    /N(MBS17),12(A$GPR),24(R0),14(DECA),17(GPROUT),7(S$ALU)  00 00706
                         *      WAIT FOR FETCH, INCREMENT DEST PTR, TEST FOR DONE               00 00707
                         MBS17  GEN    /T(MBS18,MBS24),5(FT),7(ALUS),12(A$GPR),24(R2),          00 00708
00CA 362831C080070002                  C14(INCA),16(CRY1),17(GPROUT),6(SPEC),10(WAITMD)         00 00709
                         *      INITIATE R TO L BYTE STORE, FINISH PREVIOUS BYTE STORE          00 00710
                         MBS19  GEN    /N(MBS20),10(BS$ALU),6(MEMC),12(A$GPRR),24(R2),22(4),    00 00711
00CB 05B0040398F80402                  C14(TRNA),15(LOG)                                        00 00712
                         *      DECREMENT BYTE COUNT                                            00 00713
00CC 0668008000F10000    MBS21  GEN    /N(MBS22),12(A$GPR),24(R0),14(DECA),17(GPROUT),7(S$ALU)  00 00714
                         *      INCREMENT DEST PTR, WAIT FOR FETCH, TEST FOR DONE               00 00715
                         MBS22  GEN    /T(MBS23,MBS24),5(FT),7(ALUS),12(A$GPR),24(R2),          00 00716
00CD 362031C080070002                  C14(INCA),16(CRY1),17(GPROUT),6(SPEC),10(WAITMD)         00 00717
                         *      FINISH L TO R BYTE STORE                                        00 00718
                         MBS15  GEN    /N(MBS16),11(B$SPEC),23(OLSE),14(TRNB),15(LOG),          00 00719
00CE 0648000A0A80050                   C6(SPEC),10(WAITMD)                                      00 00720
                         *                                                                      00 00721
                         *                                                                      00 00722
                         *      COMPARE BYTE STRING                                             00 00723
                         *                                                                      00 00724
                         *      CALL:       DATA  0105030                                       00 00725
                         *                  DATA UNEQUAL JUMP ADDRESS                           00 00726
                         *                                                                      00 00727
                         *      ON ENTRY:   B REG - BYTE POINTER TO STRING 1                    00 00728
                         *                  X REG - BYTE POINTER TO STRING 2                    00 00729
                         *                  A REG - NUMBER OF BYTES TO BE COMPARED              00 00730
                         *                                                                      00 00731
                         *      EXIT CONDITIONS:  IF THE TWO STRINGS ARE NOT EQUAL, THE SECOND  00 00732
                         *                  WORD IS USED AS A DIRECT JUMP ADDRESS.  OTHERWISE,  00 00733
                         *                  EXECUTION CONTINUES AFTER THE SECOND WORD.          00 00734
                         *                  POINTERS POINT TO THE BYTE AFTER THE LAST BYTE READ. 00 00735
                         *                  OVERFLOW IS SET IF STRING 1 IS GREATER, ELSE RESET. 00 00736
                         *                                                                      00 00737
                         *      WAIT FOR PARAMETER FETCH, SET SHFT AS FIRST-READ FLAG           00 00738
                         CBS0   GEN    /N(CBS1),6(SPEC),10(WAITMD),12(A$GPR),24(RE),            00 00739
00CF 06A8000080394000E                 C19(S$SHFT),14(ZERO),15(LOG),17(GPROUT)                  00 00740
                         *      CBS10 IS A 2-WORD TABLE WHICH MUST START ON AN ADDR DIV BY X'10 00 00741
                         *      START WORD FETCH FROM STRING2 IF FIRST-READ OR IF L BYTE        00 00742
                         CBS10  GEN    /N(CBS11),10(OF$ALU),6(MEMC),12(A$GPRR),24(R2),22(4),    00 00743
00D0 06F0040298F80402                  C14(TRNA),15(LOG)                                        00 00744
                         *      STRING2 R BYTE - INCREMENT STRING2 PTR AND GO USE OLD WORD      00 00745
00D1 0720000000070002           GEN    /N(CBS13),12(A$GPR),24(R2),14(INCA),16(CRY1),17(GPROUT)  00 00746
                         *      RETURN                                                          00 00747
00D2 0490090400000000    CBS18  GEN    /N(SS2M),7(PJMP$),1(0),10(IF$P),6(MEMC$)                 00 00748
                         *      SET OVFL IF STRING1 IS GREATER                                  00 00[illegible]
00D3 0690048000000000    CBS17  GEN    /N(CBS18),6(MEMC),7(2)                                   00 00[illegible]
                         *      TEST FOR DONE (UNEQUAL) OR LOOP (EQUAL), CLEAR FIRST-READ FLAG  00 00751
                         CBS19  GEN    /T(CBS16,CBS2),5(FT),7(ALU[illegible]),12(A$GPR),24(RE), 00 00752
00D4 36B832400000400E                  C19(S$SHFT)                                              00 00753
                         *      SAVE PARAMETER IN RF, INC P PAST PARAMETER, RESET OVFL          00 00754
                         CBS1   GEN    /N(CBS2),11(B$SPEC),23(MIR),14(TRNB),15(LOG),            00 00755
00D5 06B0050024A9001F                  C17(GPROUT),24(RF),7(4),6(MEMC),13(INCP)                 00 00756
                         *      DECREMENT BYTE COUNT                                            00 00757
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00D6 06D0090000F10000  755  CBS2   GEN    /N(CBS3),12(A$GPR),24(R0),14(DECA),17(GPROUT),7(S$ALU)   00 00758
                       756  *      UNEQUAL RETURN - SET P TO RF                                    00 00759
                       757  CBS16  GEN    /T(CBS17,CBS18),5(FT),12(A$GPR),24(RF),14(TRNA),        00 00760
00D7 169831C001F8000F  758           C15(LOG),13(POUT),7(ALUS)                                     00 00761
                       759  *      CBS8-CBS9 IS A 2-WORD TABLE WHICH MUST START ON AN EVEN ADDRESS 00 00762
                       760  *      MOVE STRING1 L BYTE TO OPERAND REG                              00 00763
                       761  CBS8   GEN    /N(CBS9),12(A$GPRR),24(R2),22(4),11(B$SPEC),23(OLSE),   00 00764
00D8 05C800003BA80452  762           C14(TRNB),15(LOG),13(OPROUT)                                  00 00765
                       763  *      PUT STRING1 BYTE IN RC, RT-ADJUSTED, ZERO-FILLED. SELECT STR2 RTN00 00766
                       764  CBS9   GEN    /S(CBS10,CBS10),FS2,2(1),5(FT),11(B$SPEC),23(ORZF),     00 00767
00D9 0688B28020A9006C  765           C14(TRNB),15(LOG),17(GPROUT),24(RC),7(SHFT)                   00 00768
                       766  *      TEST FOR END OF STRINGS - LOOP OR RETURN                        00 00769
                       767  CBS3   GEN    /S(CBS4,CBS18),FS2,2(3),5(FT),                          00 00770
00DA 9618B1C018000401  768           C12(A$GPRR),24(R1),22(4),7(ALUS)                               00 00771
                       769  *      INCREMENT STRING1 PTR, WAIT FOR FETCH                           00 00772
                       770  CBS5   GEN    /N(CBS6),6(SPEC),10(WAITMD),12(A$GPR),24(R1),14(INCA),  00 00773
00DB 06E0000080070001  771           C16(CRY1),17(GPROUT)                                          00 00774
                       772  *      SAVE STRING1 WORD IN RA AND OPR, SELECT SHIFT ROUTINE           00 00775
                       773  CBS6   GEN    /F(CBS8),FS2,2(1),11(B$SPEC),23(MIR),                   00 00776
00DC 4688800023A9001A  774           C14(TRNB),15(LOG),17(GPROUT),24(RA),13(OPROUT)                00 00777
                       775  *      FOR STRING1 R BYTE USE PREVIOUSLY FETCHED WORD IN RA            00 00778
                       776  CBS7   GEN    /N(CBS9),12(A$GPRR),24(R2),22(4),11(B$GPR),23(RA),       00 00779
00DD 06C800001BA804A2  777           C14(TRNB),15(LOG),13(OPROUT)                                  00 00780
                       778  *      STRING2 FIRST-READ OR L BYTE - INC STRING2 PTR, WAIT FOR FETCH   00 00781
                       779  CBS11  GEN    /N(CBS12),6(SPEC),10(WAITMD),12(A$GPR),24(R2),14(INCA),  00 00782
00DE 06F8000080070002  780           C16(CRY1),17(GPROUT)                                          00 00783
                       781  *      SAVE STRING2 WORD IN RB AND OPR, SELECT SHIFT ROUTINE           00 00784
                       782  CBS12  GEN    /F(CBS14),FS2,2(1),11(B$SPEC),23(MIR),14(TRNB),15(LOG),  00 00785
00DF 0708800023A9001B  783           C17(GPROUT),24(RB),13(OPROUT)                                 00 00786
                       784  *      CBS14-CBS15 IS A 2-WORD TABLE WHICH MUST START ON AN EVEN ADDR   00 00787
                       785  *      MOVE STRING2 L BYTE TO OPERAND REG                              00 00788
00E0 0708000023A80050  786  CBS14  GEN    /N(CBS15),11(B$SPEC),23(OLSE),14(TRNB),15(LOG),13(OPROUT)00 00789
                       787  *      SUBTRACT STRING1 BYTE - STRING2 BYTE  (RC - OPR REG, ZERO-FILLED)00 00790
                       788  CBS15  GEN    /N(CBS19),12(A$GPR),24(RC),11(B$SPEC),23(ORZF),14(SUB),  00 00791
00E1 06A0080820660060  789           C16(CRY1),7(S$ALU)                                            00 00792
                       790  *                                                                      00 00793
                       791  *                                                                      00 00794
                       792  *      CBS-MBS IS A TWO-WORD TABLE FOR FIELD-SELECT ADDRESSING          00 00795
00E2 0678000000031000E 793  CBS    GEN    /N(CBS0),14(ONES),17(GPROUT),24(RE)                     00 00796
                       794  *      SAVE P IN R7                                                    00 00797
                       795  *      SAVE P IN R9                                                    E.2*******
00E3 0598000008F90009  796  MBS    GEN    /N(MBS1),12(A$P),14(TRNA),15(LOG),17(GPROUT),24(R9)     E.2*******
                       797  *      FOR STRING2 R BYTE USE PREVIOUSLY FETCHED WORD IN RB            00 00799
00E4 0708000003F8000B  798  CBS13  GEN    /N(CBS15),12(A$GPR),24(RB),14(TRNA),15(LOG),13(OPROUT)   00 00800
                0200   800  PAGE   EQU    X'200          PAGE NUMBER                              E.2*******
                       801  *                                                                      E.2*******
                       802  *      BCS ENTRY POINTS                                                E.2*******
                       803  *                                                                      E.2*******
                       804  *                                                                      E.2*******
                       805  *      ENTRY POINT FOR STACK-JUMPS AND JUMP IF >0.                      E.2*******
                       806  *      SAMPLES A REG FOR USE BY CONDITIONAL JUMP.                       E.2*******
                       807  *                                                                      E.2*******
0015                   808         ORG    X'15                                                    E.2*******
                       809         GEN    /F(STKJ1),FSA,2(1),12(A$GPR),24(R0),14(TRNA),15(LOG),   E.2*******
0015 370A808000F80000  810           CTF0,SF0,7(S$ALU)                                             E.2*******
                       811  *                                                                      E.2*******
                       812  *      BCS ENTRY POINTS FOR RELATIONAL/LOGICAL ROUTINES                 E.2*******
                       813  *      FLAG QUOS SET OR RESET TO FLAG WHICH ENTRY WAS TAKEN.            E.2*******
                       814  *                                                                      E.2*******
0014                   815         ORG    X'14                                                    E.2*******
                       816  TFR1   GEN    /N(REL1),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),          E.2*******
0014 07C0000000F82100  817           CWF1,SC0                                                      E.2*******
0016                   818         ORG    X'16                                                    E.2*******
                       819  JIR1   GEN    /N(REL1),12(A$SPEC),22(AONES),14(TRNA),15(LOG),          E.2*******
0016 07C0000000F82200  820           CWF1,SC0                                                      E.2*******
                       821  *                                                                      E.2*******
                       822  *      BCS ENTRY - CHOOSE BETWEEN $DO1 AND MATH/SORT/INDEX.            E.2*******
                       823  *                                                                      E.2*******
0017                   824         ORG    X'17                                                    E.2*******
0017 3E0AC00000000000  825         GEN    /F(=DOIN1),FSB,2(1)                                     E.2*******
                       826  *                                                                      E.2*******
                       827  *      BCS ENTRY POINT - DOUBLE WORD INTEGER ADD AND SUBTRACT           E.2*******
                       828  *      BEGIN FETCH OF SECOND OPERAND                                   E.2*******
                       829  *                                                                      E.2*******
001C                   830         ORG    X'1C                                                    E.2*******
001C 0900040680000000  831         GEN    /N(IAR1),10(OF$MIR),6(MEMC)                             E.2*******
                       833  *                                                                      E.2*******
                       834  *      MAIN BODY OF MICRO ROUTINES                                     E.2*******
                       835  *                                                                      E.2*******
00E6                   836         ORG    X'E6                                                    E.2*******
                       837  *                                                                      E.2*******
                       838  *      FIELD SELECT ENTRY POINT FOR STACK JUMPS                         E.2*******
                       839  **     (THIS MICRO MUST BE ON AN EVEN MICRO ADDR)                       E.2*******
                       840  *                                                                      E.2*******
                       841  *                                                                      E.2*******
                       842  *      START FETCH OF STACK POINTER                                    E.2*******
                       843  *                                                                      E.2*******
                       844  STKJ1  GEN    /N(STKJ2),10(OF$ALU),6(MEMC),12(A$GPR),24(R1),          E.2*******
00E6 0768040280F80001  845           C14(TRNA),15(LOG)                                             E.2*******
                       846  *                                                                      E.2*******
                       847  *      JUMP IF A REGISTER GREATER THAN ZERO                             E.2*******
                       848  *                                                                      E.2*******
                       849  *      CALLING SEQUENCE:                                               E.2*******
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                        850   *
                        851   *       DATA 0105125
                        852   *       DATA (JUMP ADDR IF A>0)
                        853   *
                        854   **
                        855   **      TEST IF R0 WAS NEGATIVE; IF SO, A NOT >0 SO JUMP TO EXIT
                        856   **      (THIS MICRO MUST FOLLOW STKJ1)
                        857   **
00E7 674031C000000000   858   JAG1    GEN     /T(JAG2,JAG6),5(FT),7(ALUS)
                        859   *
                        860   *       TEST IF R0 WAS ZERO; IF SO, A NOT >0 SO JUMP TO EXIT
                        861   *
00E8 6750324000000000   862   JAG2    GEN     /T(JAG3,JAG6),5(FT),7(ALUZ)
                        863   **
                        864   **      A REG IS >0 SO FETCH INSTRUCTION AT JUMP ADDR;
                        865   **      IF ADDR WAS IND, FETCH EFFECTIVE ADDR;
                        866   **      (THIS MICRO MUST BE ON AN EVEN LOCATION)
                        867   **
00EA                    868           ORG     *+1
00EA 0748040600000000   869   JAG3    GEN     /N(JAG4),10(IF$MIR),6(MEMC)
                        870   *
                        871   *       TEST IF ADDR WAS INDIRECT; IF SO, BACK TO FETCH AGAIN
                        872   *       ALSO, SET NEW P VALUE.
00E9                    873           ORG     *-2
                        874   JAG4    GEN     /T(JAG5,JAG3),5(FT),7(MIRS),
00E9 575832C021A80010   875                   C11(B$SPEC),23(MIR),14(TRNB),15(LOG),13(POUT)
                        876   *
                        877   *       CONTINUE RESTART OF PIPELINE AT JUMP ADDR;
                        878   *       EXIT TO ROM.
                        879   *
00EB                    880           ORG     *+1
00EB 0168090404000000   881   JAG5    GEN     /P(SS3M),7(PJMP$),TF0,13(INCP),10(IF$P),6(MEMC$)
                        882   **
                        883   **      EXIT TO NEXT INSTRUCTION IN SEQUENCE; NO JUMP: A NOT > 0.
                        884   **      (THIS MICRO MUST BE EVEN)
                        885   **
00EC 0490090404000000   886   JAG6    GEN     /P(SS2M),7(PJMP$),TF0,13(INCP),10(IF$P),6(MEMC$)
                        888   *
                        889   *       REENTRANT SUBROUTINE CALL/RETURN
                        890   *
                        891   *       RETURN ADDRESS IS SAVED ON STACK
                        892   *
                        893   *       R1 (B REG) CONTAINS ADDRESS OF STACK POINTER
                        894   *
                        895   *       SAMPLE MICRO FLOW:
                        896   *           DIR PSHJMP : STKJ1,STKJ2,STKJ3,PSHJ1,PSHJ2,PSHJ3
                        897   *           IND PSHJMP : STKJ1,...,STKJ3,PSHJ1,PSHJ2,PSHJ4,PSHJ5,
                        898   *                        PSHJ6,PSHJ3
                        899   *           POPJMP     : STKJ1,STKJ2,STKJ3,POPJ1,POPJ2,POPJ3
                        900   *
                        901   *       CALLING SEQUENCE:
                        902   *
                        903   *           PSHJMP: DATA  0105025
                        904   *                   DATA  (JUMP ADDR)
                        905   *
                        906   *           POPJMP: DATA  0105065
                        907   *
                        908   *
                        909   *       SAVE CONTENTS OF LOC P+1 IN RF;
                        910   *       ALSO SAMPLE ITS SIGN AND INCR P REG.
                        911   *
                        912   STKJ2   GEN     /N(STKJ3),11(B$SPEC),23(MIR),14(TRNB),15(LOG),
00ED 0770008024A9001F   913                   C17(GPROUT),24(RF),7(S$ALU),13(INCP)
                        914   *
                        915   *       INITIATE STORE OF NEW STACK POINTER;
                        916   *       ALSO FIELD SELECT TO DECIDE IF PSHJMP OR POPJMP.
                        917   *
                        918   STKJ3   GEN     /F(PSHJ1),FS9,2(1),10(DS$ALU),6(MEMC),
00EE 078A440300F80001   919                   C12(A$GPR),24(R1),14(TRNA),15(LOG)
                        920   **
                        921   **      PROVIDE UPDATED STACK POINTER FOR STORE;
                        922   **      INITIATE STORE OF RETURN ADDRESS ON STACK.
                        923   **      (THIS MICRO ADDR MUST BE EVEN AND POPJ1 MUST FOLLOW PSHJ1)
                        924   **
00F0                    925           ORG     *+1
                        926   PSHJ1   GEN     /N(PSHJ2),10(DS$ALU),6(MEMC),11(B$SPEC),23(MIR),
00F0 0798040320900210   927                   C14(DECB),12(A$SPEC),22(ADNES)
                        928   *
                        929   *       PROVIDE UPDATED STACK POINTER FOR STORE;
                        930   *       INITIATE FETCH OF EXIT ADDRESS FROM STACK.
                        931   *
                        932   POPJ1   GEN     /N(POPJ2),10(DF$MIR),6(MEMC),11(B$SPEC),23(MIR),
00F1 07780406A0160110   933                   C14(INCB),16(CRY1),12(A$SPEC),22(AZERO)
                        934   *
                        935   *       WAIT FOR EXIT ADDRESS TO ARRIVE FROM MEMORY;
                        936   *       RESTART PIPELINE AT EXIT ADDRESS.
                        937   *
00EF                    938           ORG     *-3
00EF 0790040600000000   939   POPJ2   GEN     /N(POPJ3),10(IF$MIR),6(MEMC)
                        940   *
                        941   *       CONTINUE PIPELINE STARTUP;
                        942   *       EXIT BACK TO ROM TO DECODE NEXT INSTRUCTION.
                        943   *
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00F2                      ORG     *+2                                                       E.2********
                  POPJ3   GEN     /P(SS3M),7(PJMP$),6(MEMC$),10(IF$ALU),11(B$SPEC),          E.2********
                                  C23(MIR),14(INCB),16(CRY1),12(A$SPEC),22(AZERO),           E.2********
00F2 0168090221160110             C13(POUT)                                                 E.2********
                  *                                                                         E.2********
                  *       PROVIDE RETURN ADDRESS FOR STORE ON STACK;                        E.2********
                  *       CHECK IF JUMP ADDRESS IS INDIRECT;(NOTE, SIGN OF JUMP ADDR        E.2********
                  *       WAS SAMPLED BACK AT STKJ2.)                                       E.2********
                  *                                                                         E.2********
                  PSHJ2   GEN     /T(PSHJ3,PSHJ4),5(FT),7(ALUS),12(A$P),                     E.2********
00F3 37A031C088F80000             C14(TRNA),15(LOG),6(SPEC),10(WAITMD)                       E.2********
                  *                                                                         E.2********
                  *       SET P TO JUMP ADDRESS;                                            E.2********
                  *       RESTART PIPELINE; EXIT BACK TO ROM.                               E.2********
                  *                                                                         E.2********
                  PSHJ3   GEN     /P(SS2M),7(PJMP$),6(MEMC$),10(IF$ALU),13(POUT),            E.2********
00F4 0490090201F8000F             C12(A$GPR),24(RF),14(TRNA),15(LOG)                         E.2********
                  **                                                                        E.2********
                  **      FETCH EFFECTIVE JUMP ADDRESS USING INDIRECT POINTER;              E.2********
                  **      (THIS MICRO ADDR MUST BE EVEN)                                    E.2********
                  **                                                                        E.2********
00F6                      ORG     *+1                                                       E.2********
                  PSHJ4   GEN     /N(PSHJ5),10(OF$ALU),6(MEMC),12(A$GPR),24(RF),             E.2********
00F6 07A8040280F8000F             C14(TRNA),15(LOG)                                         E.2********
                  *                                                                         E.2********
                  *       WAIT FOR EFFECTIVE ADDRESS TO ARRIVE;                             E.2********
                  *                                                                         E.2********
00F5                      ORG     *-2                                                       E.2********
00F5 07B8000080000000 PSHJ5 GEN   /N(PSHJ6),6(SPEC),10(WAITMD)                              E.2********
                  *                                                                         E.2********
                  *       CHECK IF ANOTHER LEVEL OF INDIRECT                                E.2********
                  *                                                                         E.2********
00F7                      ORG     *+1                                                       E.2********
                  PSHJ6   GEN     /T(PSHJ3,PSHJ4),5(FT),7(MIRS),11(B$SPEC),23(MIR),          E.2********
00F7 37A032C020A9001F             C14(TRNB),15(LOG),17(GPROUT),24(RF)                        E.2********
                  *                                                                         E.2********
                  *       RELATIONAL/LOGICAL CONVERSION ROUTINES                            E.2********
                  *                                                                         E.2********
                  *       TWO SINGLE PRECISION FLOATING POINT NUMBERS ARE COMPARED. THE     E.2********
                  *       FOLLOWING OPTIONS ARE ALLOWED BY THESE ROUTINES:                  E.2********
                  *               1) JUMP IF SPECIFIED RELATION MET; (BCS X'14).            E.2********
                  *               2) TEST FOR SPECIFIED RELATION; SET A TO ONES IF          E.2********
                  *                  RELATION MET OR TO ZERO IF NOT; (BCS X'16).            E.2********
                  *               3) THREE WAY BRANCH ON LT,EQ,AND GT;                      E.2********
                  *                  (BCS X'14 OR X'16).                                    E.2********
                  *                                                                         E.2********
                  *       PARAMETER FIELD OF BCS SPECIFIES RELATION AS FOLLOWS:             E.2********
                  *               0 - NE                                                    E.2********
                  *               1 - EQ                                                    E.2********
                  *               2 - LT                                                    E.2********
                  *               3 - GE                                                    E.2********
                  *               4 - 3 WAY BRANCH                                          E.2********
                  *               5 - 3 WAY BRANCH                                          E.2********
                  *               6 - LE                                                    E.2********
                  *               7 - GT                                                    E.2********
                  *                                                                         E.2********
                  *       REGISTER USAGE:                                                   E.2********
                  *               R8 - ADDR OF FIRST OPERAND                                E.2********
                  *               R9 - FIRST WORD OF FIRST OPERAND                          E.2********
                  *               RA - SECOND WORD OF FIRST OPERAND                         E.2********
                  *               RE - DIFFERENCE BETWEEN OPERANDS; ALSO SET TO FLAG REL    E.2********
                  *               RF - ADDR OF SECOND OPERAND                               E.2********
                  *               MIR- FIRST/SECOND WORD OF SECOND OPERAND                  E.2********
                  *               OPR- DIFFERENCE BETWEEN OPERAND SECOND WORDS.             E.2********
                  *               QUOS - IF ONE, THEN JUMP IF RELATION MET; SET AT ENTRY    E.2********
                  *                                                                         E.2********
                  *       CAUTION: THIS ROUTINE MAY NOT BE USED TO COMPARE DOUBLE-WORD      E.2********
                  *               FIXED POINT NUMBERS SINCE FORMATS OF NEGATIVE NUMBERS     E.2********
                  *               ARE NOT CONSISTENT.                                       E.2********
                  *                                                                         E.2********
                  *                                                                         E.2********
                  *       BEGIN FETCH OF WORD ONE, OPERAND ONE (OR IND ADDR)                E.2********
                  *                                                                         E.2********
00F8 07C8040680000000 REL1 GEN    /N(REL2),10(OF$MIR),6(MEMC)                               E.2********
                  *                                                                         E.2********
                  *       IF ADDRESS WAS INDIRECT, LOOP BACK TO FETCH FINAL ADDR;           E.2********
                  *       SAVE FINAL ADDR;                                                  E.2********
                  *                                                                         E.2********
                  REL2    GEN     /T(REL1,REL3),5(TT),7(MIRS),11(B$SPEC),23(MIR),            E.2********
00F9 57C022C020A90018             C14(TRNB),15(LOG),17(GPROUT),24(R8)                        E.2********
                  *                                                                         E.2********
                  **      INITIATE FETCH OF ADDR OF OPERAND TWO                             E.2********
                  **      (THIS MICRO ADDR MUST BE EVEN)                                    E.2********
                  **                                                                        E.2********
00FA 07D8040484000000 REL3 GEN    /N(REL4),13(INCP),10(OF$P),6(MEMC)                        E.2********
                  *                                                                         E.2********
                  *       SAVE WORD ONE, OPERAND ONE                                        E.2********
                  *                                                                         E.2********
                  REL4    GEN     /N(REL5),11(B$SPEC),23(MIR),14(TRNB),15(LOG),              E.2********
00FB 07E0000020A90019             C17(GPROUT),24(R9)                                        E.2********
                  *                                                                         E.2********
                  *       BEGIN FETCH OF WORD ONE, OPERAND TWO (OR IND ADDR).               E.2********
                  *                                                                         E.2********
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00FC 07E80406800000000  REL5   GEN    /N(REL6),10(OF$MIR),6(MEMC)                              E.2********
                        *                                                                       E.2********
                        *      IF ADDR WAS INDIRECT, LOOP BACK TO FETCH FINAL ADDR;             E.2********
                        *      SAVE FINAL ADDR;                                                 E.2********
                        *                                                                       E.2********
                        REL6   GEN    /T(REL5,REL7),5(TT),7(MIRS),11(B$SPEC),23(MIR),           E.2********
00FD 77E022C020A9001F                 C14(TRNB),15(LOG),17(GPROUT),24(RF)                       E.2********
                        **                                                                      E.2********
                        **     INITIATE FETCH OF SECOND WORD, OPERAND ONE;                      E.2********
                        **     (THIS MICRO ADDR MUST BE EVEN).                                  E.2********
                        **                                                                      E.2********
                        REL7   GEN    /N(REL8),10(OF$ALU),6(MEMC),12(A$GPR),24(R8),             E.2********
00FE 07F8050280060008                 C14(INCA),16(CRY1),7(ROVFL)                               E.2********
                        *                                                                       E.2********
                        *      COMPARE FIRST TWO WORDS OF OPERANDS                              E.2********
                        *                                                                       E.2********
                        REL8   GEN    /N(REL9),12(A$GPR),24(R9),11(B$SPEC),23(MIR),             E.2********
00FF 0800028020660019                 C14(SUB),16(CRY1),7(S$OVF$+S$ALU),TF0,SF0                 E.2********
                        *                                                                       E.2********
                        *      IF OVERFLOW OCCURED, JUMP TO MAKE LT/GT DECISION                 E.2********
                        *                                                                       E.2********
0100 5808300000000000   REL9   GEN    /T(REL10,REL20),5(FT),7(OVFL)                             E.2********
                        *                                                                       E.2********
                        *      IF SIGN SET, THEN JUMP TO LT STATE                               E.2********
                        *                                                                       E.2********
0101 681031C000000000   REL10  GEN    /T(REL11,RLT),5(FT),7(ALUS)                               E.2********
                        *                                                                       E.2********
                        *      IF FIRST WORDS OF OPERANDS ARE EQUAL, BEGIN FETCH OF OP2 SECONE.2********
                        *      WORD; ELSE JUMP TO GT STATE.                                     E.2********
                        *                                                                       E.2********
                        REL11  GEN    /T(REL12,RGT),5(TT),7(ALUZ),10(OF$ALU),6(TESTT),          E.2********
0102 78182E428006000F                 C12(A$GPR),24(RF),14(INCA),16(CRY1)                       E.2********
                        *                                                                       E.2********
                        *      SAVE SECOND WORD OF OPERAND ONE                                  E.2********
                        *                                                                       E.2********
                        REL12  GEN    /N(REL13),11(B$SPEC),23(MIR),14(TRNB),15(LOG),            E.2********
0103 0820000020A9001A                 C17(GPROUT),24(RA)                                        E.2********
                        *                                                                       E.2********
                        *      WAIT FOR SECOND WORD OF OPERAND TWO                              E.2*****
                        *                                                                       E.2*****
0104 0828000080000000   REL13  GEN    /N(REL14),6(SPEC),10(WAITMD)                              E.2********
                        *                                                                       E.2********
                        *      COMPARE SECOND WORDS OF OPERANDS;                                E.2********
                        *      NOTE: OVERFLOW SHOULD NOT BE POSSIBLE DUE TO SNGL                E.2********
                        *      PRECISION FP FORMAT.                                             E.2********
                        *                                                                       E.2********
                        REL14  GEN    /N(REL15),12(A$GPR),24(RA),11(B$SPEC),23(MIR),            E.2********
0105 083002802366001A                 C14(SUB),16(CRY1),7(S$OVF$+S$ALU),TF0,SF0,13(OPROUT)      E.2********
                        *                                                                       E.2********
                        *      IF WORDS EQUAL, JUMP TO EQ STATE                                 E.2********
                        *                                                                       E.2********
0106 4868224000000000   REL15  GEN    /T(REQ,REL16),5(TT),7(ALUZ)                               E.2********
                        **                                                                      E.2********
                        **     TOGGLE SIGN IF OPERANDS (FIRST WORD) ARE NEGATIVE                E.2********
                        **     (THIS MICRO ADDR MUST BE EVEN)                                   E.2********
                        **                                                                      E.2********
0108                           ORG    *+1          PUT ON EVEN WORD                             E.2********
                        REL16  GEN    /N(REL17),12(A$GPR),24(R9),11(B$SPEC),23(OPR),            E.2********
0108 0248008020680009                 C14(EOR),15(LOG),TF0,SF0,7(S$ALU)                         E.2********
                        *                                                                       E.2********
                        *      IF SIGN SET, JUMP TO LT STATE; ELSE, GT STATE.                   E.2********
                        *                                                                       E.2********
0109 786021C000000000   REL17  GEN    /T(RLT,RGT),5(TT),7(ALUS)                                 E.2********
                        **                                                                      E.2********
                        **     MAKE LT/GT DECISION AFTER OVERFLOW                               E.2********
                        **     (THIS MICRO ADDR MUST BE EVEN)                                   E.2********
                        **                                                                      E.2********
010A 687021C000000000   REL20  GEN    /T(RGT,RLT),5(TT),7(ALUS)                                 E.2********
                        **                                                                      E.2********
                        **     SIGNAL LT,EQ, OR GT BY LOADING RE WITH -1,0,OR 1.                E.2********
                        **     BRANCH TO RELATIONAL CHECK USING PARAMETER FIELD OF DCS          E.2********
                        **     (THIS MICRO ADDR MUST BE EVEN)                                   E.2********
                        **                                                                      E.2********
010C                           ORG    *+1                                                       E.2********
                        RLT    GEN    /F(TJNE),FS9,2(7),12(A$SPEC),22(AZERO),                   E.2********
010C 08BA408004F1010E                 C14(DECA),17(GPROUT),24(RE),TF0,SF0,7(S$ALU),13(INCP)     E.2********
                        REQ    GEN    /F(TJNE),FS9,2(7),12(A$SPEC),22(AZERO),                   E.2********
                                      C14(TRNA),15(LOG),17(GPROUT),24(RE),TF0,SF0,              E.2********
010D 08BA408004F9010E                 C7(S$ALU),13(INCP)                                        E.2********
                        RGT    GEN    /F(TJNE),FS9,2(7),12(A$SPEC),22(AZERO),                   E.2********
                                      C14(INCA),16(CRY1),17(GPROUT),24(RE),TF0,SF0,             E.2********
010E 08BA408004070 10E                C7(S$ALU),13(INCP)                                        E.2********
                        *                                                                       E.2********
                        *      RELATIONAL TESTS                                                 E.2********
                        *      THESE MICROS TEST FOR ONE OF THE 6 RELATIONS OR                  E.2*****
                        *      BEGIN PROCESSING THE THREE WAY BRANCH (AIF).                     E.2*****
                        *      THESE MICROS MUST BE ON AN 8 WORD BOUNDARY.                      E.2********
                        *                                                                       E.2********
0110                           ORG    *+1          PUT ON EVEN WORD                             E.2********
0110 48C8324000000000   TJNE   GEN    /T(RMET,RNOT),5(FT),7(ALUZ)                               E.2********
0111 48C8224000000000   TJEQ   GEN    /T(RMET,RNOT),5(TT),7(ALUZ)                               E.2********
0112 48C821C000000000   TJLT   GEN    /T(RMET,RNOT),5(TT),7(ALUS)                               E.2********
0113 48C831C000000000   TJGE   GEN    /T(RMET,RNOT),5(FT),7(ALUS)                               E.2********
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                        1131  AIF1   GEN    /N(AIF2),10(OF$ALU),6(MEMC),12(A$P),11(B$GPR),23(RE),   E.2*********
0114 08E00402889600E0   1132         C14(ADD),16(CRY1)     *** FETCH 3-WAY JUMP ADDR ***             E.2*********
                        1133         GEN    /N(AIF2),10(OF$ALU),6(MEMC),12(A$P),11(B$GPR),23(RE),   E.2*********
0115 08E00402889600E0   1134         C14(ADD),16(CRY1)     *** FETCH 3-WAY JUMP ADDR ***             E.2*********
0116 0880008000F0000E   1135  TJLE   GEN    /N(TJNE),12(A$GPR),24(RE),14(DECA),7(S$ALU),TF0,SF0       E.2*********
0117 0880008000F0000E   1136  TJGT   GEN    /N(TJEQ),12(A$GPR),24(RE),14(DECA),7(S$ALU),TF0,SF0       E.2*********
                        1137  *                                                                       E.2*********
                        1138  *      FLAG RELATION TRUE; TEST QUOS TO DECIDE IF JUMP WANTED.          E.2*********
                        1139  *                                                                       E.2*********
0119                    1140         ORG    *+1                                                      E.2*********
                        1141  RMET   GEN    /T(TFR2,JIR2),5(FT),7(QUOS),12(A$SPEC),22(ADNES),        E.2*********
0119 58D833C000F90200   1142         C14(TRNA),15(LOG),17(GPROUT),24(R0)                             E.2*********
                        1143  **                                                                      E.2*********
                        1144  **     FLAG RELATION FALSE; TEST QUOS TO DECIDE IF JUMP WANTED.          E.2*********
                        1145  **     THIS MICRO ADDR MUST BE EVEN.                                    E.2*********
0118                    1146         ORG    *-2                                                      E.2*********
                        1147  RNOT   GEN    /T(TFR2,JIR2),5(FT),7(QUOS),12(A$SPEC),22(AZERO),        E.2*********
0118 58D833C000F90100   1148         C14(TRNA),15(LOG),17(GPROUT),24(R0)                             E.2*********
                        1149  *                                                                       E.2*********
                        1150  *      NO JUMP- RETURN LOGICAL VALUE IN R0;                             E.2*********
                        1151  *      EXIT TO ROM.                                                     E.2*********
                        1152  *                                                                       E.2*********
011B                    1153         ORG    *+2                                                      E.2*********
011B 0490090400000000   1154  TFR2   GEN    /P(SS2M),7(PJMP$),6(MEMC$),TF0,10(IF$P)                  E.2*********
                        1155  **                                                                      E.2*********
                        1156  **     JUMP IF RELATION MET;                                            E.2*********
                        1157  **     ADVANCE P TO SKIP JUMP ADDR OTHERWISE.                           E.2*********
                        1158  **     THIS MICRO ADDR MUST BE EVEN.                                    E.2*********
                        1159  **                                                                      E.2*********
011A                    1160         ORG    *-2                                                      E.2*********
                        1161  JIR2   GEN    /T(TFR2,AIF1),5(FT),7(GPRS),12(A$SPEC),22(ADNES),        E.2*********
011A 28D8334004F1020E   1162         C14(DECA),17(GPROUT),24(RE),13(INCP)                            E.2*********
                        1163  **                                                                      E.2*********
                        1164  **     FETCH NEXT INSTRUCTION (OR IND ADDR).                            E.2*********
                        1165  **     THIS MICRO ADDR MUST BE EVEN                                     E.2*********
011C                    1166         ORG    *+1                                                      E.2*********
011C 08E80406000000000  1167  AIF2   GEN    /N(AIF3),10(IF$MIR),6(MEMC)                              E.2*********
                        1168  *                                                                       E.2*********
                        1169  *      IF INDIRECT ADDR, LOOP BACK TO FETCH EFFECTIVE ADDR;             E.2*********
                        1170  *      SAVE EFFECTIVE ADDR IN P.                                        E.2*********
                        1171  *                                                                       E.2*********
                        1172  AIF3   GEN    /T(AIF4,AIF2),5(FT),7(MIRS),11(B$SPEC),23(MIR),          E.2*********
011D 68F032C021A80010   1173         C14(TRNB),15(LOG),13(POUT)                                      E.2*********
                        1174  *                                                                       E.2*********
                        1175  *      CONTINUE RESTART OF PIPELINE;                                    E.2*********
                        1176  *      EXIT TO ROM.                                                     E.2*********
                        1177  *                                                                       E.2*********
011E 0168090404000000   1178  AIF4   GEN    /P(SS3M),7(PJMP$),6(MEMC$),TF0,13(INCP),10(IF$P)         E.2*********
                        1180  *                                                                       E.2*********
                        1181  *      TWO WORD INTEGER MATH ROUTINES                                   E.2*********
                        1182  *                                                                       E.2*********
                        1183  *      CALLING SEQUENCE:                                                E.2*********
                        1184  *              (OPERAND 1 IN A/B REGISTER)                              E.2*********
                        1185  *              BCS                                                      E.2*********
                        1186  *              DATA  (ADDR OF OPERAND 2)                                E.2*********
                        1187  *                                                                       E.2*********
                        1188  *                                                                       E.2*********
                        1189  *      BCS VALUES:                                                      E.2*********
                        1190  *              IAD - 0105304                                            E.2*********
                        1191  *              ISB - 0105374                                            E.2*********
                        1192  *              IMV - 0105027                                            E.2*********
                        1193  *              IDV - 0105067                                            E.2*********
                        1194  *                                                                       E.2*********
                        1195  ***************                                                         E.2*********
                        1196  **                                                                      E.2*********
                        1197  **     IF OPERAND ADDRESS IS INDIRECT, LOOP BACK TO RESOLVE IT;          E.2*********
                        1198  **     SAVE EFFECTIVE ADDRESS IN RC.                                    E.2*********
                        1199  **     (THIS MICRO ADDR MUST BE EVEN)                                   E.2*********
                        1200  **                                                                      E.2*********
0120                    1201         ORG    *+1              LEAVE SPACE FOR IAR4                    E.2*********
                        1202  IAR1   GEN    /T(IAR3,IAR2),5(FT),7(MIRS),11(B$SPEC),23(MIR),          E.2*********
0120 191832C020A9001C   1203         C14(TRNB),15(LOG),17(GPROUT),24(RC)                             E.2*********
0122                    1204         ORG    *+1              LEAVE SPACE FOR SOIN1                   E.2*********
                        1205  **                                                                      E.2*********
                        1206  **     FETCH INDIRECT ADDR                                              E.2*********
                        1207  **     (THIS MICRO ADDR MUST BE EVEN)                                   E.2*********
                        1208  **                                                                      E.2*********
0122 0900040680000000   1209  IAR2   GEN    /N(IAR1),10(OF$MIR),6(MEMC)                              E.2*********
                        1210  **                                                                      E.2*********
                        1211  **     INITIATE FETCH OF SECOND OPERAND WORD; CLEAR OVERFLOW FLAG.       E.2*********
                        1212  **                                                                      E.2*********
                        1213  IAR3   GEN    /N(IAR4),10(OF$ALU),6(MEMC),12(A$GPR),24(RC),            E.2*********
0123 08F80502800S000C   1214         C14(INCA),16(CRY1),7(ROVFL)                                     E.2*********
                        1215  *                                                                       E.2*********
                        1216  *      SAVE FIRST WORD OF OPERAND 2                                     E.2*********
                        1217  *                                                                       E.2*********
                01241218  IAORG1 EQU    *                SAVE POSITION                           E.2*********
011F                    1219         ORG    IAR1-1           RELOCATE IAR4                           E.2*********
                        1220  IAR4   GEN    /N(IAR5),11(B$SPEC),23(MIR),                             E.2*********
011F 0920000020A9001C   1221         C14(TRNB),15(LOG),17(GPROUT),24(RC)                             E.2*********
0124                    1222         ORG    IAORG1           RESTORE POSITION                        E.2*********
                        1223  *                                                                       E.2*********
                        1224  *      BEGIN FETCH OF NEXT INSTRUCTION TO RESTART PIPELINE AND          E.2*********
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                        1225   *       FORCE COMPLETION OF FETCH OF SECOND WORD OF OPERAND 2.
                        1226   *
0124 092804040,4000000  1227   IAR5    GEN      /N(IAR6),10(IF$P),6(MEMC),13(INCP)
                        1228   *
                        1229   *       SAVE SECOND WORD OF OPERAND 2;
                        1230   *       USE FIELD SELECT ON BCS TO BRANCH TO ADD/SUBTRACT OR
                        1231   *       MULTIPLY/DIVIDE ROUTINES.
                        1232   *
                        1233   IAR6    GEN      /F(IMD1),FSA,2(1),11(B$SPEC),23(MIR),
0125 390A800020A9001D   1234                    C14(TRNB),15(LOG),17(GPROUT),24(RD)
                        1236   *
                        1237   *       MULTIPLY-DIVIDE COMMON MICROS
                        1238   *
                        1239   **
                        1240   **      INITIALIZES SIGN FLAG (RA AND QUOS);
                        1241   **      TESTS SIGN OF OP1 AND IF NEG, JUMPS TO COMPLEMENT IT.
                        1242   **      (THIS MICRO ADDR MUST BE EVEN).
                        1243   **
                        1244   IMD1    GEN      /T(IMD2,IMD3),5(TT),7(GPRS),12(A$SPEC),22(AZERO),
0126 5940234000F9210A   1245                    C14(TRNA),15(LOG),17(GPROUT),24(RA),WF1,SC0
0128                    1246            ORG      *+1              LEAVE SPACE FOR IAS1
                        1247   *
                        1248   *       MAKE OP1 POSITIVE   ; TOGGLE SIGN FLAG .
                        1249   *
                        1250   IMD2    GMSK     /P(PAGE+ICMP),10(STACK),16(PUSH),
0128 1B780006E00032A2   1251                    C15(PAGE+IMD3),LB3,TF0,SF0
                        1252   **
                        1253   **      TRANSFER MS(OP1) ;
                        1254   **      (THIS MICRO ADDR MUST BE EVEN)
                        1255   **
012A                    1256            ORG      *+1              ALLIGN EVEN LOCATIONS
                        1257   IMD3    GEN      /N(IMD4),11(B$GPR),23(R0),14(TRNB),15(LOG),
012A 095800000A90008    1258                    C17(GPROUT),24(R8)
                        1259   *
                        1260   *       TRANSFER LS(OP1) ;
                        1261   *
                        1262   IMD4    GEN      /N(IMD5),11(B$GPR),23(R1),14(TRNB),15(LOG),
012B 096000000A900191   1263                    C17(GPROUT),24(R9)
                        1264   *
                        1265   *       SETUP MS(OP2) FOR POTENTIAL COMPLEMENT.
                        1266   *
                        1267   IMD5    GEN      /N(IMD6),11(B$GPR),23(RC),14(TRNB),15(LOG),
012C 096800000A900C01   1268                    C17(GPROUT),24(R0)
                        1269   *
                        1270   *       SETUP LS(OP2);
                        1271   *       IF OP2 NOT NEGATIVE, SKIP COMPLEMENT.
                        1272   *
                        1273   IMD6    GEN      /T(IMD8,IMD7),5(FT),7(GPRS),11(B$GPR),23(RD),
012D 797833400 0A900D11 1274                    C14(TRNB),15(LOG),17(GPROUT),24(R1)
                        1275   **
                        1276   **      MAKE OP2 POSITIVE; TOGGLE SIGN FLAG.
                        1277   **      (THIS MICRO ADDR MUST BE EVEN)
                        1278   **
012E 1B780006E00032F2   1279   IMD7    GMSK     /P(PAGE+ICMP),10(STACK),16(PUSH),15(PAGE+IMD8),
                        1280                    CLB3,TF0,SF0
                        1281   *
                        1282   *       TRANSFER MS(OP2)
                        1283   *
                        1284   IMD8    GEN      /N(IMD9),11(B$GPR),23(R0),14(TRNB),15(LOG),
012F 098000000A9000B    1285                    C17(GPROUT),24(RB)
                        1286   *
                        1287   *       CLEAR R0 INPREPARATION FOR FIRST MULTIPLY
                        1288   *
                        1289   IMD9    GEN      /N(IMD10),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),
0130 0988000000F90100   1290                    C17(GPROUT),24(R0)
                        1291   *
                        1292   *       TRANSFER LS(OP2);
                        1293   *       USE FIELD SELECT TO CHOOSE BETWEEN MULTIPLY AND DIVIDE.
                        1294   *
                        1295   IMD10   GEN      /F(IMU1),FS9,2(1),11(B$GPR),23(R1),14(TRNB),15(LOG),
0131 198A400000A9001C   1296                    C17(GPROUT),24(RC)
                        1298   *
                        1299   *       MICROS UNIQUE TO MULTIPLY
                        1300   *
                        1301   **
                        1302   **      SETUP LS(OP1)FOR FIRST MULTIPLY;
                        1303   **      (THIS MICRO ADDR MUST BE EVEN).
                        1304   **
                        1305   IMU1    GEN      /N(IMU3),11(B$GPR),23(R9),14(TRNB),15(LOG),
0132 09A0000000A900911  1306                    C17(GPROUT),24(R1)
0134                    1307            ORG      *+1              ALLOW SPACE FOR IDV1
                        1308   *
                        1309   *       MULTIPLY LS(OP1) AND LS(OP2)
                        1310   *
                        1311   IMU3    GMSK     /P(PAGE+MUL),10(STACK),16(PUSH),15(PAGE+IMU4),
0134 12080006E00033521  1312                    CLB3,TF0,SF0
                        1313   *
                        1314   *       SAVE LS(LSXLS)
                        1315   *
                        1316   IMU4    GEN      /N(IMU5),11(B$GPR),23(R1),14(TRNB),15(LOG),
0135 098000000A9001D    1317                    C17(GPROUT),24(RD)
                        1318   *
                        1319   *       SETUP MS(OP1) FOR NEXT MULTIPLY
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                         1320  *
                         1321  IMU5   GEN     /N(IMU6),11(B$GPR),23(R8),14(TRNB),15(LOG),
0136 09B8000000A90081    1322                C17(GPROUT),24(R1)
                         1323  *
                         1324  *       MULTIPLY MS(OP1) AND LS(OP2); (PLUS MS(LSXLS)).
                         1325  *
                         1326  IMU6   GMSK    /P(PAGE+MUL),10(STACK),16(PUSH),15(PAGE+IMU7),
0137 12080006E00033821327                CLB3,TF0,SF0
                         1328  *
                         1329  *       SAMPLE MOST SIGNIFICANT WORD OF PRODUCT, MS(MSXLS).
                         1330  *
                         1331  IMU7   GEN     /N(IMU8),12(A$GPR),24(R0),14(TRNA),15(LOG),
0138 09C8008000F800001332                CTF0,SF0,7(S$ALU)
                         1333  *
                         1334  *       SAVE LS(MS*LS); BRANCH TO SET OVERFLOW IF
                         1335  *       MS(MS*LS) WAS NONZERO.
                         1336  *
                         1337  IMU8   GEN     /T(IMU9,IMU10),5(FT),7(ALUZ),11(B$GPR),23(R1),
0139 69D0324000A9001A1338                C14(TRNB),15(LOG),17(GPROUT),24(RA)
                         1339  *
                         1340  *       SET OVERFLOW; CLEAR R0. (UNUSED MEM REQ DUE TO SOVFL FIELDS).
                         1341  *
                         1342  IMU9   GEN     /N(IMU10),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),
013A 09E0048400F901001343                C17(GPROUT),24(R0),7(SOVFL),10(IF$P),6(MEMC)
                         1344  **
                         1345  **      SETUP MS(OP2) FOR MULTIPLY
                         1346  **      (THIS MICRO ADDR MUST BE EVEN).
                         1347  **
013C                     1348          ORG     *+1             PUT ON EVEN LOCATION
                         1349  IMU10  GEN     /N(IMU11),11(B$GPR),23(RB),14(TRNB),15(LOG),
013C 09E8000000A900BC1350                C17(GPROUT),24(RC)
                         1351  *
                         1352  *       SETUP LS(OP1) FOR MULTIPLY
                         1353  *
                         1354  IMU11  GEN     /N(IMU12),11(B$GPR),23(R9),14(TRNB),15(LOG),
013D 09F0000000A90091 1355               C17(GPROUT),24(R1)
                         1356  *
                         1357  *       MULTIPLY LS(OP1) AND MS(OP2)
                         1358  *
                         1359  IMU12  GMSK    /P(PAGE+MUL),10(STACK),16(PUSH),15(PAGE+IMU13),
013E 12080006E00033F21360                CLB3,TF0,SF0
                         1361  *
                         1362  *       SAMPLE MOST SIGNIFICANT WORD OF PRODUCT, MS(LSXMS).
                         1363  *
                         1364  IMU13  GEN     /N(IMU14),12(A$GPR),24(R0),14(TRNA),15(LOG),
013F 0A00008000F800001365                CTF0,SF0,7(S$ALU)
                         1366  *
                         1367  *       SAVE LS(LS*MS); BRANCH TO SET OVERFLOW IF
                         1368  *       MS(LS*MS) WAS NONZERO.
                         1369  *
                         1370  IMU14  GEN     /T(IMU15,IMU16),5(FT),7(ALUZ),11(B$GPR),23(R1),
0140 1A08324000A90010 1371               C14(TRNB),15(LOG),17(GPROUT),24(R0)
                         1372  *
                         1373  *       SET OVERFLOW;
                         1374  *       CAUTION: THIS WILL RESULT IN OVERRIDE IF MEMORY ACTIVE.
                         1375  *
0141 0A1004800000000001376  IMU15  GMSK    /N(IMU16),7(SOVFL),SF1,TF0,10(IF$OVR)
                         1377  **
                         1378  **      GET MOST SIGNIFICANT WORD OF RESULT BY
                         1379  **      LS(LSXMS)+(LS(MSXLS)+MS(LSXLS)).
                         1380  **      (THIS MICRO ADDR MUST BE EVEN).
                         1381  **
                         1382  IMU16  GEN     /N(IMU17),12(A$GPR),24(R0),11(B$GPR),23(RA),
0142 0A1802000091 00A01383               C14(ADD),17(GPROUT),7(S$OVFC)
                         1384  *
                         1385  *       SETUP LEAST SIG WORD OF RESULT, LS(LSXLS).
                         1386  *
                         1387  IMU17  GEN     /N(IMU18),11(B$GPR),23(R0),14(TRNB),15(LOG),
0143 0A2000000A900D11388                 C17(GPROUT),24(R1)
                         1389  *
                         1390  *       SAMPLE MS(OP2) AS PART OF FINAL OVERFLOW CHECK.
                         1391  *
                         1392  IMU18  GEN     /N(IMU19),12(A$GPR),24(RB),14(TRNA),15(LOG),
0144 0A2800800 0F8000B1393               C7(S$ALU)
                         1394  *
                         1395  *       IF MS(OP2) WAS ZERO, COULD'NT CAUSE OVERFLOW SO JUMP TO EXIT;
                         1396  *       ELSE, CHECK MS(OP1).
                         1397  *
0145 3A4822400000000 0 1398  IMU19  GEN     /T(IMU23,IMU20),5(TT),7(ALUZ)
                         1399  *
                         1400  *       CHECK MS(OP1)
                         1401  **      (THIS MICRO ADDR MUST BE EVEN)
                         1402  *
                         1403  IMU20  GEN     /N(IMU21),12(A$GPR),24(R8),14(TRNA),15(LOG),
0146 0A3800800 0F8000 81404              C7(S$ALU)
                         1405  *
                         1406  *       IF MS(OP1) IS ALSO NON-ZERO, JUMP TO SET OVERFLOW.
                         1407  *
0147 4A4822400000000001408  IMU21  GEN     /T(IMU23,IMU22),5(TT),7(ALUZ)
                         1409  *
                         1410  *       SET OVERFLOW; CAUTION: MEMORY OVERPIDE IF MEMORY ACTIVE
                         1411  **      (THIS MICRO ADDR MUST BE EVEN)
                         1412  *
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0148 0A4804800000000001413  IMU22  GEN     /N(IMU23),7(SOVFL),SF1,TF0,10(IF$OVR)                    E.2*********
                         1414  *                                                                    E.2*********
                         1415  *       TEST SIGN FLAG (QUOS) TO SEE IF RESULT SHOULD BE NEGATIVE.   E.2*********
                         1416  *                                                                    E.2*********
0149 5A5833C000000000001417  IMU23  GEN     /T(IMU25,IMU24),5(FT),7(QUOS)                            E.2*********
                         1418  *                                                                    E.2*********
                         1419  *       MAKE RESULT NEGATIVE                                         E.2*********
                         1420  **      (THIS MICRO ADDR MUST BE EVEN)                               E.2*********
                         1421  *                                                                    E.2*********
                         1422  IMU24  GMSK    /P(PAGE+ICMP),10(STACK),16(PUSH),                     E.2*********
014A 1B780006E00034B21423                     C15(PAGE+IMU25),LB3,TF0,SF0                          E.2*********
                         1424  *                                                                    E.2*********
                         1425  *       EXIT BACK TO ROM                                             E.2*********
                         1426  *                                                                    E.2*********
014B 0490000180000000001427  IMU25  GEN     /P(SS2M),10(PJMP),SF0,TF0                            E.2*********
                         1429  *                                                                    E.2*********
                         1430  *       UNIQUE DIVIDE MICROS                                         E.2*********
                         1431  *                                                                    E.2*********
                    014C1432  DVORG1 EQU     *                                                      E.2*********
                         1433  *                                                                    E.2*********
                         1434  *       SAMPLE MS(OP2) TO SEE IF SHOULD DIVIDE BY IT.                E.2*********
                         1435  *                                                                    E.2*********
0133                     1436         ORG     IMU1+1          PLACE IN FIELD SELECT TABLE         E.2*********
                         1437  IDV1   GEN     /N(IDV2),12(A$GPR),24(RB),14(TRNA),15(LOG),          E.2*********
0133 0A60008000F8000B1438                     C7(S$ALU)                                            E.2*********
014C                     1439         ORG     DVORG1          RESTORE ORG ADDR                    E.2*********
                         1440  *                                                                    E.2*********
                         1441  *       CLEAR R0! IF MS(OP2) WAS NOT ZERO, JUMP TO DIVIDE BY IT.     E.2*********
                         1442  *       ELSE, CONTINUE IN SEQUENCE TO DIVIDE BY LS.                  E.2*********
                         1443  *                                                                    E.2*********
                         1444  IDV2   GEN     /T(IDV3,IDV20),5(TT),7(ALUZ),12(A$SPEC),22(AZERO),   E.2*********
014C 7A6822400F90100 1445                     C14(TRNA),15(LOG),17(GPROUT),24(R0)                  E.2*********
                         1446  *                                                                    E.2*********
                         1447  *       CHECK IF LS(OP2) IS ZERO                                     E.2*********
                         1448  *                                                                    E.2*********
                         1449  IDV3   GEN     /N(IDV4),12(A$GPR),24(RC),14(TRNA),15(LOG),          E.2*********
014D 0A78008000F8000C1450                     C7(S$ALU)                                            E.2*********
014F                     1451         ORG     *+1             LEAVE ROOM FOR IDV20                E.2*********
                         1452  *                                                                    E.2*********
                         1453  *       SETUP MS(OP1) FOR DIVIDE;                                    E.2*********
                         1454  *       IF LS(OP2) WAS ALSO ZERO, JUMP TO OVERFLOW EXIT.             E.2*********
                         1455  *                                                                    E.2*********
                         1456  IDV4   GEN     /T(IDVDF,IDV5),5(TT),7(ALUZ),11(B$GPR),23(R8),       E.2*********
014F 0AC8224000A900811457                     C14(TRNB),15(LOG),17(GPROUT),24(R1)                  E.2*********
                         1458  *                                                                    E.2*********
                         1459  *       DIVIDE MS(OP1) BY LS(OP2)                                    E.2*********
                         1460  *                                                                    E.2*********
                         1461  IDV5   GMSK    /P(PAGE+DIV),10(STACK),16(PUSH),                     E.2*********
0150 11800006E00035121462                     C15(PAGE+IDV6),LB3,TF0,SF0                           E.2*********
                         1463  *                                                                    E.2*********
                         1464  *       SAVE QUOTIENT AS MOST SIG WORD OF RESULT.                    E.2*********
                         1465  *                                                                    E.2*********
                         1466  IDV6   GEN     /N(IDV7),11(B$GPR),23(R1),14(TRNB),15(LOG),          E.2*********
0151 0A90000000A9001D1467                     C17(GPROUT),24(RD)                                   E.2*********
                         1468  *                                                                    E.2*********
                         1469  *       SETUP LS(OP1) FOR DIVIDE                                     E.2*********
                         1470  *                                                                    E.2*********
                         1471  IDV7   GEN     /N(IDV8),11(B$GPR),23(R9),14(TRNB),15(LOG),          E.2*********
0152 0A98000000A90091 1472                    C17(GPROUT),24(R1)                                   E.2*********
                         1473  *                                                                    E.2*********
                         1474  *       DIVIDE REMAINDER + LS(OP1) BY LS(OP2).                       E.2*********
                         1475  *                                                                    E.2*********
                         1476  IDV8   GMSK    /P(PAGE+DIV),10(STACK),16(PUSH),                     E.2*********
0153 11800006E00035421477                     C15(PAGE+IDV9),LB3,TF0,SF0                           E.2*********
                         1478  *                                                                    E.2*********
                         1479  *       SETUP MOST SIG WORD OF RESULT IN R0 FOR RETURN.              E.2*********
                         1480  *       LEAST SIG WORD IS IN R1 FROM PREVIOUS DIVISION.              E.2*********
                         1481  *                                                                    E.2*********
                         1482  IDV9   GEN     /N(IDV10),11(B$GPR),23(RD),14(TRNB),15(LOG),         E.2*********
0154 0AAB000000A900D01483                     C17(GPROUT),24(R0)                                   E.2*********
                         1484  *                                                                    E.2*********
                         1485  *       SAMPLE SIGN FLAG TO SEE IF RESULT SHOULD BE NEGATIVE.        E.2*********
                         1486  *                                                                    E.2*********
                         1487  IDV10  GEN     /N(IDV11),12(A$GPR),24(RA),14(TRNA),15(LOG),         E.2*********
0155 0AB0008000F8000A1488                     C7(S$ALU)                                            E.2*********
                         1489  *                                                                    E.2*********
                         1490  *       IF RESULT SHOULD BE POSITIVE, JUMP TO EXIT.                  E.2*********
                         1491  *                                                                    E.2*********
0156 4AB821C000000000 1492   IDV11  GEN     /T(IDV12,IDV13),5(TT),7(ALUS)                        E.2*********
                         1493  *                                                                    E.2*********
                         1494  *       MAKE RESULT NEGATIVE                                         E.2*********
                         1495  *                                                                    E.2*********
                         1496  IDV12  GMSK    /P(PAGE+ICMP),10(STACK),16(PUSH),                    E.2*********
0157 1B780006E00035821497                     C15(PAGE+IDV13),LB3,TF0,SF0                          E.2*********
                         1498  *                                                                    E.2*********
                         1499  *       EXIT TO ROM.                                                 E.2*********
                         1500  *                                                                    E.2*********
0158 0490000180000000 1501   IDV13  GEN     /P(SS2M),10(PJMP),SF0,TF0                            E.2*********
                         1503  **                                                                   E.2*********
                         1504  **      OVERFLOW EXIT - ATTEMPTED DIVISION BY ZERO;                  E.2*********
                         1505  *       SET OVERFLOW; CAUTION: MEM OVERRIDE IF MEM ACTIVE            E.2*********
                         1506  *       RESTORE MS(OP1)                                              E.2*********
                         1507  **      (THIS MICRO ADDR MUST BE EVEN).                              E.2*********
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                      **
                      IDVOF  GEN    /N(IDVOF3),7(SOVFL),SF1,TF0,10(IF$OVR),
0159 0AD0048000A90080                C11(B$GPR),23(R8),14(TRNB),15(LOG),17(GPROUT),24(R0)
                      *
                      *      RESTORE LS(OP1) ; JUMP TO CHECK SIGN THEN EXIT.
                      *
                      IDVOF3 GEN    /N(IDV10),11(B$GPR),23(R9),14(TRNB),15(LOG),
015A 0AA8000000A90091                C17(GPROUT),24(R1)
                      *
                      *      SETUP MS(OP1) FOR DIVISION
                      *
                 015B DVORG2 EQU    *
014E                         ORG    IDV3+1         ADJUST ORG TO ALLOW COND ADDR.
                      IDV20  GEN    /N(IDV21),11(B$GPR),23(R8),14(TRNB),15(LOG),
014E 0AD8000000A90081                C17(GPROUT),24(R1)
015B                         ORG    DVORG2         RESTORE ORG ADDR
                      *
                      *      SAVE LS(OP2) FOR LATER USE
                      *
                      IDV21  GEN    /N(IDV22),11(B$GPR),23(RC),14(TRNB),15(LOG),
015B 0AE0000000A900CD                C17(GPROUT),24(RD)
                      *
                      *      SETUP MS(OP2) FOR DIVISION
                      *
                      IDV22  GEN    /N(IDV23),11(B$GPR),23(RB),14(TRNB),15(LOG),
015C 0AE8000000A900BC                C17(GPROUT),24(RC)
                      *
                      *      DIVIDE MS(OP1) BY MS(OP2) TO GET TRIAL QUOTIENT
                      *
                      IDV23  GMSK   /P(PAGE+DIV),10(STACK),16(PUSH),
015D 11800006E00035E2                C15(PAGE+IDV24),LB3,TF0,SF0
                      *
                      *      SAVE REMAINDER
                      *
                      IDV24  GEN    /N(IDV25),11(B$GPR),23(R0),14(TRNB),15(LOG),
015E 0AF8000000A90008                C17(GPROUT),24(R8)
                      *
                      *      SETUP QUOTIENT FOR MULTIPLY CHECK.
                      *
                      IDV25  GEN    /N(IDV26),11(B$GPR),23(R1),14(TRNB),15(LOG),
015F 0B00000000A9001C                C17(GPROUT),24(RC)
                      *
                      *      SETUP LS(OP1) FOR MULTIPLY
                      *
                      IDV26  GEN    /N(IDV27),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),
0160 0B08000000F90100                C17(GPROUT),24(R0)
                      IDV27  GEN    /N(IDV28),11(B$GPR),23(RD),14(TRNB),15(LOG),
0161 0B10000000A900D1                C17(GPROUT),24(R1)
                      *
                      *      MULTIPLY TRIAL QUOTIENT BY LS(OP1)
                      *
                      IDV28  GMSK   /P(PAGE+MUL),10(STACK),16(PUSH),
0162 12080006E0003632                C15(PAGE+IDV29),LB3,TF0,SF0
                      *
                      *      COMPARE MOST SIG WORD OF PRODUCT TO REMAINDER FROM THE
                      *      DIVISION;
                      *
                      IDV29  GEN    /N(IDV30),12(A$GPR),24(R8),11(B$GPR),23(R0),
0163 0B20008000660008                C14(SUB),16(CRY1),7(S$ALU)
                      *
                      *      IF NOT EQUAL, SKIP SECOND WORD COMPARE
                      *
0164 3B28224000000000 IDV30  GEN    /T(IDV31,IDV32),5(TT),7(ALUZ)
                      *
                      *      COMPARE LEAST SIG WORD OF PRODUCT TO LS(OP1)
                      *
                      IDV31  GEN    /N(IDV32),12(A$GPR),24(R9),11(B$GPR),23(R1),
0165 0B30008000660019                C14(SUB),16(CRY1),7(S$ALU)
                      *
                      *      GREATER? IF PRODUCT OF TRIAL QUOTIENT AND LS(OP2) GREATER
                      *      THAN REMAINDER+LS(OP1), THEN TRIAL QUOTIENT ONE TOO LARGE;
                      *      ELSE TRIAL QUOTIENT IS ACCURATE.
                      *
0166 4B3831C000000000 IDV32  GEN    /T(IDV33A,IDV33B),5(FT),7(ALUS)
                      *
                      *      RETURN TRIAL QUOTIENT AS RESULT
                      *
                      IDV33A GEN    /N(IDV34),11(B$GPR),23(RC),14(TRNB),15(LOG),
0167 0B48000000A900C1                C17(GPROUT),24(R1)
                      **
                      **     RETURN TRIAL QUOTIENT -1 AS RESULT
                      **     (THIS MICRO ADDR MUST BE EVEN).
                      **
                      IDV33B GEN    /N(IDV34),11(B$GPR),23(RC),14(DECB),12(A$SPEC),
0168 0B480000009102C1                C22(AONES),17(GPROUT),24(R1)
                      *
                      *      CLEAR MOST SIG WORD OF RESULT; EXIT TO SIGN CHECKS.
                      *
                      IDV34  GEN    /N(IDV10),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),
0169 0AA8000000F90100                C17(GPROUT),24(R0)
                      *
                      *      FIRST MICRO UNIQUE TO DOUBLE ADD/SUBTRACT :
                      *      SHIFTS LS(OP2) LEFT IN PREPARATION FOR ADD/SUB;
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                     1603  *       USES FIELD SELECT TO CHOOSE ADD OR SUBTRACT.
                     1604  *
                016A 1605  IADRG2  EQU     *               SAVE POSITION
0127                 1606          ORG     IMD1+1          PLACE MICRO IN FSEL TBL
                     1607  IAS1    GEN     /F(IAS2),FS9,2(1),12(A$GPRL),24(RD),
0127 5B0A400010F9000D1608                  C14(TRNA),15(LOG),17(GPROUT)
016A                 1609          ORG     IADRG2          RESTORE POSITION
                     1610  **
                     1611  **      ADD LS WORDS OF OPERANDS ; SAMPLE CARRY
                     1612  **      (THIS MICRO ADDR MUST BE EVEN).
                     1613  **
                     1614  IAS2    GEN     /N(IAS4),12(A$GPRL),24(R1),11(B$GPR),23(RD),
016A 0B7000801091000D1615                  C14(ADD),17(GPROUT),7(S$ALU)
                     1616  *
                     1617  *        SUBTRACT LS WORDS OF OPERANDS; SAMPLE CARRY
                     1618  *
                     1619  IAS3    GEN     /N(IAS4),12(A$GPRL),24(R1),11(B$GPR),23(RD),
016B 0B7000801067000D1620                  C14(SUB),16(CRY1),17(GPROUT),7(S$ALU)
                     1621  *
                     1622  *       SHIFT LS RESULT RIGHT ;
                     1623  *       FIELD SELECT JUMP TO ADD OR SUBTRACT MS WORDS.
                     1624  *
016E                 1625          ORG     *+2             RELOCATE IAS4
                     1626  IAS4    GEN     /F(IAS5),FS9,2(1),12(A$GPRR),24(R1),SH4,
016E 6B0A400018F904011627                  C14(TRNA),15(LOG),17(GPROUT)
                     1628  **
                     1629  **      ADD MS WORDS; (WITH STORED CARRY); SAMPLE OVERFLOW AND ALU;
                     1630  **      RETURN TO ROM.
                     1631  **      (THIS MICRO ADDR MUST BE EVEN)
                     1632  **
016C                 1633          ORG     *-3             BACK UP TO EVEN PAIR
                     1634  IAS5    GEN     /P(SS2M),SF0,TF0,10(PJMP),GFA,12(A$GPR),24(R0),
016C 0490028180930 0C01635                 C11(B$GPR),23(RC),14(ADD),CF1,17(GPROUT)
                     1636  *
                     1637  *       SUBTRACT MS WORDS, WITH STORED CARRY; SAMPLE OVERFLOW AND ALU.
                     1638  *       RETURN TO ROM.
                     1639  *
                     1640  IAS6    GEN     /P(SS2M),SF0,TF0,10(PJMP),GFA,12(A$GPR),24(R0),
016D 0490028180630 0C01641                 C11(B$GPR),23(RC),14(SUB),CF1,17(GPROUT)
016F                 1642          ORG     *+1             SKIP PAST RELOCATED IAS4
                     1644  *
                     1645  *       COMPLEMENT DOUBLE INTEGER SUBROUTINE
                     1646  *
                     1647  *       R0,R1 CONTAINS INTEGER
                     1648  *
                     1649  *       RA IS ONES COMPLEMENTED TO ACT AS SIGN FLAG.
                     1650  *       QUOS RECORDS SIGN OF RA.
                     1651  *
                     1652  **********
                     1653  *
                     1654  *       CHECK LEAST SIG WORD
                     1655  *
016F 0B80008000F8000 11656 ICMP    GEN     /N(ICMP1),12(A$GPR),24(R1),14(TRNA),15(LOG),7(S$ALU)
                     1657  *
                     1658  *       IF LS ZERO, JUMP TO TWO'S COMPL MS;
                     1659  *
0170 4B8832400000000 01660 ICMP1   GEN     /T(ICMP2,ICMP9),5(FT),7(ALUZ)
                     1661  *
                     1662  *       TWO'S COMPLEMENT LS
                     1663  *
                     1664  ICMP2   GEN     /N(ICMP3),11(B$GPR),23(R1),14(TCB),16(CRY1),
0171 0B900000002701111665                  C12(A$SPEC),22(AZERO),17(GPROUT),24(R1)
                     1666  *
                     1667  *       CLEAR SIGN OF LS
                     1668  *
                     1669  ICMP3   GMSK    /N(ICMP4),12(A$GPR),16(R1),11(LIT),15(X'8000),
0172 0B9800006 3B800011670                 C14(AND),13(OPROUT)
                     1671  ICMP4   GEN     /N(ICMP5),11(B$SPEC),23(OPR),14(TRNB),15(LOG),
0173 0BA0000020A900011672                  C17(GPROUT),24(R1)
                     1673  *
                     1674  *       ONES COMPLEMENT MS
                     1675  *
                     1676  ICMP5   GEN     /N(ICMP6),12(A$GPR),24(R0),
0174 0BA8000000090000 1677                 C14(NOTA),15(LOG),17(GPROUT)
                     1678  *
                     1679  *       ONES COMPLEMENT SIGN FLAG RA; SET QUOS;
                     1680  *
                     1681  ICMP6   GEN     /N(ICMP7),12(A$GPR),24(RA),14(NOTA),15(LOG),
0175 0BB000000009200A1682                  C17(GPROUT),WF1,SC0
                     1683  *
                     1684  *       EXIT TO CALLER
                     1685  *
0176 00000006E0000004 1686 ICMP7   GEN     10(STACK),24(POPJMP),LB3,TF0,SF0,BB0
                     1687  *
                     1688  *       DECREMENT MS TO GET TWO'S COMPL
                     1689  *
0178                 1690          ORG     *+1             PUT ON EVEN LOCATION
                     1691  ICMP9   GEN     /N(ICMP5),12(A$GPR),24(R0),14(DECA),
0178 0BA0000000F10000 1692                 C17(GPROUT)
                     1694  *
                     1695  *       SQUARE ROOT AND INDEXING COMMON MICROS
                     1696  *
                     1697  *
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                        1698  *       CHECK FOR SIGN BIT ON INDEX ADDR;                                                    E.2*********
                        1699  *       IF SET, LOOP ON IOP2 UNTIL REACH END OF IND ADDR CHAIN.                              E.2*********
                        1700  *       ALSO SAVE ADDR OF OPERAND                                                            E.2*********
                        1701  *       THEN FIELD SELECT TO EITHER SQUARE ROOT OR INDEX                                      E.2*********
                        1702  *                                                                                            E.2*********
0121                    1703          ORG     IAR1+1          PLACE MICRO IN FIELD SELECT TABLE                          E.2*********
                        1704  SQIN1   GEN     /S(SQ1,SQIN2),5(FT),7(MIRS),FS9,2(1),                                      E.2*********
0121 1C0A72C020A90018   1705                C11(B$SPEC),23(MIR),14(TRNB),15(LOG),17(GPROUT),24(R8)                       E.2*********
                        1706  *                                                                                            E.2*********
                        1707  *       FOLLOW INDIRECT ADDRESS CHAIN                                                        E.2*********
                        1708  *                                                                                            E.2*********
0182                    1709          ORG     X'182           PLACE TO ALLOW TEST ADDRESSING                             E.2*********
0182 0908040680000000   1710  SQIN2   GEN     /N(SQIN1),6(MEMC),10(OF$MIR)                                               E.2*********
                        1712  *                                                                                            E.2*********
                        1713  *       SINGLE PRECISION FLOATING POINT SQUARE ROOT                                           E.2*********
                        1714  *                                                                                            E.2*********
                        1715  *       USES TABLE LOOKUP TO GET INITIAL GUESS, THEN PERFORMS                                E.2*********
                        1716  *       TWO ITERATIONS THROUGH  Y2= 1/2(X/Y1 +Y1).                                           E.2*********
                        1717  *                                                                                            E.2*********
                        1718  *       CALLING SEQUENCE:                                                                    E.2*********
                        1719  *                                                                                            E.2*********
                        1720  *               DATA    0105127                                                              E.2*********
                        1721  *               DATA    ADDR OF OPERAND                                                      E.2*********
                        1722  *                                                                                            E.2*********
                        1723  *       RESULT RETURNED IN AB REG.                                                           E.2*********
                        1724  *                                                                                            E.2*********
                        1725  *       REGISTER USAGE:                                                                      E.2*********
                        1726  *                                                                                            E.2*********
                        1727  *               R0,R1 - TEMPORARY VALUES; FINAL RESULT                                       E.2*********
                        1728  *               R8,R9 - LEFT JUSTIFIED OPERAND (WITHOUT EXPONENT).                           E.2*********
                        1729  *               RA    - EXPONENT                                                             E.2*********
                        1730  *               RC    - Y1, INTERMEDIATE RESULT                                              E.2*********
                        1731  *               OPR   - TEMP, STORAGE;(BYTE SWAPPING USED FOR SHIFT 8)                       E.2*********
                        1732  *                                                                                            E.2*********
                        1733  *                                                                                            E.2*********
                        1734  *       START FETCH OF SECOND WORD OF OPERAND; CLEAR OVERFLOW.                                E.2*********
                        1735  **      THIS MICRO MUST BE ON A 16 WORD BOUNDARY TO ALLOW 'S'                                 E.2*********
                        1736  *                                                                                            E.2*********
0180                    1737          ORG     X'180           PLACE ON 16 WORD BLOCK                                     E.2*********
                        1738  SQ1     GEN     /N(SQ2),10(OF$ALU),6(MEMC),12(A$GPR),24(R8),                               E.2*********
0180 0C1805028006000    1739                C14(INCA),16(CRY1),7(ROVFL)                                                  E.2*********
0183                    1740          ORG     *+2             LEAVE ROOM FOR IOP3 AND SQIN2                              E.2*********
                        1741  *                                                                                            E.2*********
                        1742  *       FIRST OPERAND WORD TO R8; SAMPLE                                                     E.2*********
                        1743  *                                                                                            E.2*********
                        1744  SQ2     GEN     /N(SQ3),11(B$SPEC),23(MIR),14(TRNB),15(LOG),                               E.2*********
0183 0C2000020A90018    1745                C17(GPROUT),24(R8),7(S$ALU)                                                  E.2*********
                        1746  *                                                                                            E.2*********
                        1747  *       RESTART PIPELINE FOR EXIT IF NEGATIVE ; CLEAR R0,                                    E.2*********
                        1748  *                                                                                            E.2*********
                        1749  SQ3     GEN     /T(SQ4,SQOVF),5(FT),7(ALUS),10(IF$P),6(MEMC),                              E.2*********
                        1750                C13(INCP),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),                             E.2*********
0184 3C2835C404F90100   1751                C17(GPROUT),24(R0)                                                           E.2*********
                        1752  *                                                                                            E.2*********
                        1753  *       SAVE SECOND OPERAND WORD IN R9                                                        E.2*********
                        1754  *                                                                                            E.2*********
                        1755  SQ4     GEN     /N(SQ5),11(B$SPEC),23(MIR),14(TRNB),15(LOG),                               E.2*********
0185 0C40000020A90019   1756                C17(GPROUT),24(R9)                                                           E.2*********
                        1757  *                                                                                            E.2*********
                        1758  *       OVERFLOW EXIT - CAN'T TAKE ROOT OF NEGATIVE; CLEAR R0,R1.                            E.2*********
                        1759  *                                                                                            E.2*********
                        1760  SQOVF   GEN     /N(SQOVF1),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),                           E.2*********
0186 0C38048400F90100   1761                C17(GPROUT),24(R0),10(IF$P),6(MEMC),7(SOVFL)                                 E.2*********
                        1762  SQOVF1  GEN     /P(SS2M),10(PJMP),SF0,TF0,12(A$SPEC),22(AZERO),                             E.2*********
0187 0490000180F90101   1763                C14(TRNA),15(LOG),17(GPROUT),24(R1)                                          E.2*********
                        1764  *                                                                                            E.2*********
                        1765  *       ADD 0201 TO EXPONENT TO OBTAIN CORRECT BIAS AFTER SHIFT.                              E.2*********
                        1766  *                                                                                            E.2*********
                        1767  SQ5     GMSK    /N(SQ6),12(A$GPR),16(R8),11(LIT),15(X'BF7F),                                E.2*********
0188 0C4800063BF7F8     1768                C14(ADD),13(OPROUT)                                                          E.2*********
                        1769  *                                                                                            E.2*********
                        1770  *       SAMPLE ADJUSTED EXPONENT EVEN OR ODD                                                 E.2*********
                        1771  *                                                                                            E.2*********
0189 0C50008020A80040   1772  SQ6     GEN     /N(SQ7),11(B$SPEC),23(ORSE),14(TRNB),15(LOG),7(S$ALU)                       E.2*********
                        1773  *                                                                                            E.2*********
                        1774  *       TRANSFER EXPONENT (OPR LEFT BYTE),TO RA.                                             E.2*********
                        1775  *                                                                                            E.2*********
                        1776  SQ7     GEN     /N(SQ8),11(B$SPEC),23(OLSE),        EXP TO RGHT BYTE                       E.2*********
018A 0C5800023A80050    1777                C14(TRNB),15(LOG),13(OPROUT)                                                 E.2*********
                        1778  SQ8     GEN     /N(SQ9),11(B$SPEC),23(ORLZ),        EXP TO LEFT BYTE                       E.2*********
018B 0C60000020A9007A   1779                C14(TRNB),15(LOG),17(GPROUT),24(RA)                                          E.2*********
                        1780  *                                                                                            E.2*********
                        1781  *       TRANSFER REST OF FIRST OP WORD TO R8                                                  E.2*********
                        1782  *                                                                                            E.2*********
                        1783  SQ9     GMSK    /N(SQ10),12(A$GPR),16(R8),11(LIT),15(X'FF80),                               E.2*********
018C 0C68000063BFF808   1784                C14(AND),13(OPROUT)                                                          E.2*********
                        1785  SQ10    GEN     /N(SQ11),11(B$SPEC),23(ORLZ),14(TRNB),15(LOG),                              E.2*********
018D 0C70000020A90078   1786                C17(GPROUT),24(R8)                                                           E.2*********
                        1787  *                                                                                            E.2*********
                        1788  *       SETUP SECOND OP WORD FOR COMBINATION WITH FIRST                                       E.2*********
                        1789  *                                                                                            E.2*********
                        1790  SQ11    GEN     /N(SQ12),12(A$GPRL),24(R9),14(TRNA),15(LOG),                                E.2*********
018E 0C78000013F80009   1791                C13(OPROUT)                                                                  E.2*********
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                     1792  *
                     1793  *       SHIFT BY 8 (WITH BYTE SWQP) AND PUT RESULT BACK IN R9
                     1794  *
                     1795  SQ12    GEN      /N(SQ13),11(B$SPEC),23(ORLZ),14(TRNB),15(LOG),
018F 0C8000020A900791796                    C17(GPROUT),24(R9)
                     1797  *
                     1798  *       RIGHT JUSTIFY LEFT BYTE TO SIMULATE 8 BIT SHIFT INTO NEXT WORD
                     1799  *
                     1800  SQ13    GEN      /N(SQ14),11(B$SPEC),23(OLSE),
0190 0C8800023A800501801                    C14(TRNB),15(LOG),13(OPROUT)
                     1802  *
                     1803  *       COMBINE FIRST OP WORD AND TOP OF SECOND OP WORD;
                     1804  *       IF EXPONENT WAS ODD,  JUMP TO SKIP RIGHT SHIFT.
                     1805  *
                     1806  SQ14    GEN      /T(SQ17,SQ15),5(TT),7(ALUS),12(A$GPR),24(R8),
0191 1CA021C020110068 1807                  C11(B$SPEC),23(ORZF),14(OR),17(GPROUT)
                     1808  **
                     1809  **      SHIFT COMBINED FIRST OP WORD RIGHT ONE
                     1810  **      (THIS MICRO ADDR MUST BE EVEN)
                     1811  **
                     1812  SQ15    GEN      /N(SQ16),12(A$GPRR),SH4,24(R8),14(TRNA),15(LOG),
0192 0C9800018F904081813                    C17(GPROUT)
                     1814  *
                     1815  *       SHIFT SECOND WORD OF COMBINED OP RIGHT ONE;
                     1816  *       SET BIT 15 FROM COPY OF FIRST WORD IN OPR
                     1817  *
                     1818  SQ16    GEN      /N(SQ17),12(A$GPRR),24(R9),SH3,14(TRNA),15(LOG),
0193 0CA0000018F903091819                   C17(GPROUT)
                     1820  *
                     1821  *       TRANSFER FIRST OP WORD TO IBR FOR FIELD SELECTION CHOICE
                     1822  *       OF INITIAL Y1 VALUES.
                     1823  *
                     1824  SQ17    GEN      /N(SQ18),12(A$GPRR),24(R8),14(TRNA),15(LOG),
0194 0CA8000218F800081825                   CSF0,IM4
0195 0CB0000018F800081826  SQ18    GEN      /N(SQ19),12(A$GPRR),24(R8),14(TRNA),15(LOG)
                     1827  *
                     1828  *       CLEAR SIGN BIT OF SECOND OP WORD BY RIGHT SHIFT;
                     1829  *       TRANSFER FIRST OP WORD ON TO I.
                     1830  *
                     1831  SQ19    GEN      /N(SQ20),12(A$GPRR),SH4,24(R9),14(TRNA),15(LOG),
0196 0CB8004018F904091832                   C17(GPROUT),TF0,SF0,7(IBR$I)
                     1833  *
                     1834  *       SETUP FIRST OP WORD FOR MULTIPLY;
                     1835  *       USE FIELD SELECT TO CHOOSE 'K' VALUE TO MULTIPLY.
                     1836  *
                     1837  SQ20    GEN      /F(SQ21A),FSF,2(7),11(B$GPR),23(R8),
0197 4CBBC00000A90081838                    C14(TRNB),15(LOG),17(GPROUT),24(R1)
                     1839  **
                     1840  **      CHOOSE INITIAL VALUE FOR MULTIPLY;
                     1841  **      TH'S TABLE MUST BE ON AN EVEN 8 WORD BOUNDARY.
                     1842  **
0198                 1843          ORG      X'198
0198 0C3000000000000 1844  SQ21A   GEN      /N(SQOVF)      OVERFLOW - NOT NORMALIZED OP
0199 0C3000000000000 1845  SQ21B   GEN      /N(SQOVF)      OVERFLOW - NOT NORMALIZED OP
                     1846  SQ21C   GMSK     /N(SQ22),11(LIT),15(X'8CED),      1(V8-2)   071432
019A 0D00000063A8CED0 1847                  C14(TRNB),13(OPROUT)
                     1848  SQ21D   GMSK     /N(SQ22),11(LIT),15(X'9EFD),      2(V)-V6)  060402
019B 0D00000063A9EFD0 1849                  C14(TRNB),13(OPROUT)
                     1850  SQ21E   GMSK     /N(SQ22),11(LIT),15(X'AEA1),      2(V3-V2)  050536
019C 0D00000063AAEA10 1851                  C14(TRNB),13(OPROUT)
                     1852  SQ21F   GMSK     /N(SQ22),11(LIT),15(X'AEA1),                050536
019D 0D00000063AAEA10 1853                  C14(TRNB),13(OPROUT)
                     1854  SQ21G   GMSK     /N(SQ22),11(LIT),15(X'B867),      2(6-V3)   042230
019E 0D00000063AB8670 1855                  C14(TRNB),13(OPROUT)
                     1856  SQ21H   GMSK     /N(SQ22),11(LIT),15(X'B867),                042230
019F 0D00000063AB8670 1857                  C14(TRNB),13(OPROUT)
                     1858  *
                     1859  *       SETUP CONSTANT VALUE FOR MULTIPLY.
                     1860  *
                     1861  SQ22    GEN      /N(SQ23),11(B$SPEC),23(OPR),14(TRNB),15(LOG),
01A0 0D0800020A9000C1862                    C17(GPROUT),24(RC)
                     1863  *
                     1864  *       MULTIPLY CONSTANT BY FIRST WORD OF OPERAND
                     1865  *
                     1866  SQ23    GMSK     /P(PAGE+MUL),10(STACK),16(PUSH),
01A1 1208000 6E0003A221867                  C15(PAGE+SQ24),LB3,TF0,SF0
                     1868  *
                     1869  *       FIELD SELECT TO CHOOSE SECOND CONSTANT TO ADD TO RESULT
                     1870  *
01A2 4D3BC000000000001871  SQ24    GEN      /F(SQ25A),FSF,2(7)
                     1872  **
                     1873  **      CHOOSE CONSTANT AND ADD INTO PRODUCT
                     1874  **      THIS TABLE MUST BE ON AN EVEN 8 WORD BOUNDARY
                     1875  **
01A8                 1876          ORG      X'1A8
01A8 0C3000000000000 1877  SQ25A   GEN      /N(SQOVF)      OVERFLOW - BAD OP
01A9 0C3000000000000 1878  SQ25B   GEN      /N(SQOVF)      OVERFLOW - BAD OP
                     1879  SQ25C   GMSK     /N(SQ26),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),
01AA 0D8000006 39DC950 1880                 C15(D'156225)  (26-7V6)32                  021552
                     1881  SQ25D   GMSK     /N(SQ26),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),
01AB 0D8000006 39D5E20 1882                 C15(D'152742,  (26V8-15V6)/32              025035
                     1883  SQ25E   GMSK     /N(SQ26),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),
01AC 0D8000006 39CDEA0 1884                 C15(D'146752)  (13V8-7V3)/16               031025
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                   SQ25F  GMSK    /N(SQ26),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),  E.2********
01AD 0D800000639CDEA0                     C15(O'146752)                               031025    E.2********
                   SQ25G  GMSK    /N(SQ26),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),  E.2********
01AE 0D800000639C4700                     C15(O'142160)  1-2(2-V3)                     035617    E.2********
                   SQ25H  GMSK    /N(SQ86),12(A$GPR),16(R0),11(LIT),14(ADD),13(OPROUT),  E.2********
01AF 0D800000639C4960                     C15(O'142226)  1-2(2-V3)(1-2**(-15))         035551    E.2********
                   *                                                                     E.2********
                   *      TRANSFER SUM TO RC FOR DIVIDE;                                 E.2********
                   *      SAMPLE FOR OVERFLOW,(IE ALU SIGN).                             E.2********
                   *                                                                     E.2********
                   SQ26   GEN     /N(SQ27),11(B$SPEC),23(OPR),14(TRNB),15(LOG),          E.2********
01B0 0D88008020A9000C             C17(GPROUT),24(RC),7(S$ALU)                            E.2********
                   *                                                                     E.2********
                   *      SETUP FIRST OP WORD FOR DIVIDE;                                E.2********
                   *                                                                     E.2********
                   SQ27   GEN     /N(SQ28),11(B$GPR),23(R8),14(TRNB),15(LOG),            E.2********
01B1 0D90000000A90080             C17(GPROUT),24(R0)                                     E.2********
                   *                                                                     E.2********
                   *      SETUP SECOND OP WORD FOR DIVIDE:                               E.2********
                   *      IF GOT OVERFLOW (ALUS) IN LAST SUM, TAKE QUICK EXIT            E.2********
                   *                                                                     E.2********
                   SQ28   GEN     /T(SQ29,SQ38),5(FT),7(ALUS),11(B$GPR),23(R9),          E.2********
01B2 6D9831C000A90091             C14(TRNB),15(LOG),17(GPROUT),24(R1)                    E.2********
                   *                                                                     E.2********
                   *      DIVIDE OP BY Y1                                                E.2********
                   *                                                                     E.2********
                   SQ29   GMSK    /P(PAGE+DIV),10(STACK),16(PUSH),                       E.2********
01B3 11800006E0003B42             C15(PAGE+SQ30),LB3,TF0,SF0                             E.2********
                   *                                                                     E.2********
                   *      Y2 = (X/Y1)+Y1                                                 E.2********
                   *                                                                     E.2********
                   SQ30   GEN     /N(SQ31),12(A$GPR),24(RC),11(B$GPR),23(R1),            E.2********
01B4 0DA80000091001C             C14(ADD),17(GPROUT)                                    E.2********
                   *                                                                     E.2********
                   *      Y2 = 1/2 (X/Y1 + Y1)                                           E.2********
                   *                                                                     E.2********
                   SQ31   GEN     /N(SQ32),12(A$GPRR),SH4,24(RC),14(TRNA),15(LOG),       E.2********
01B5 0DB0000018F9040C             C17(GPROUT)                                            E.2********
                   *                                                                     E.2********
                   *      SETUP  OPERAND FOR SECOND DIVIDE                               E.2********
                   *                                                                     E.2********
                   SQ32   GEN     /N(SQ33),11(B$GPR),23(R8),14(TRNB),15(LOG),            E.2********
01B6 0DB8000000A90080             C17(GPROUT),24(R0)                                     E.2********
                   SQ33   GEN     /N(SQ34),11(B$GPR),23(R9),14(TRNB),15(LOG),            E.2********
01B7 0DC0000000A90091             C17(GPROUT),24(R1)                                     E.2********
                   *                                                                     E.2********
                   *      DIVIDE OP BY Y2 TO GET MS RESULT WORD                          E.2********
                   *                                                                     E.2********
                   SQ34   GMSK    /P(PAGE+DIV),10(STACK),16(PUSH),                       E.2********
01B8 11800006E0003B92             C15(PAGE+SQ35),LB3,TF0,SF0                             E.2********
                   *                                                                     E.2********
                   *      SAVE MS RESULT WORD                                            E.2********
                   *                                                                     E.2********
                   SQ35   GEN     /N(SQ36),11(B$GPR),23(R1),14(TRNB),15(LOG),            E.2********
01B9 0DD0000000A90018             C17(GPROUT),24(R8)                                     E.2********
                   *                                                                     E.2********
                   *      DIVIDE AGAIN BY Y2 TO GET LS RESULT WORD                       E.2********
                   *                                                                     E.2********
                   SQ36   GEN     /N(SQ37),12(A$SPEC),22(AZERO),14(TRNA),15(LOG),        E.2********
01BA 0DD8000000F90101             C17(GPROUT),24(R1)                                     E.2********
                   SQ37   GMSK    /P(PAGE+DIV),10(STACK),16(PUSH),                       E.2********
01BB 11800006E0003BC2             C15(PAGE+SQ38),LB3,TF0,SF0                             E.2********
                   **                                                                    E.2********
                   **     TRANSFER LS RESULT WORD TO OPR FOR SHIFTING.                   E.2********
                   **     ( THIS MICRO ADDR MUST BE EVEN ).                              E.2********
                   **                                                                    E.2********
01BC 0DE8000003F80001 SQ38   GEN     /N(SQ39),13(A$GPR),24(R1),14(TRNA),15(LOG),13(OPROUT) E.2********
                   *                                                                     E.2********
                   *      SETUP LEFT BYTE OF LS FOR COMBINATION WITH MS RESULT WORD      E.2********
                   *                                                                     E.2********
                   SQ39   GEN     /N(SQ40),11(B$SPEC),23(OLSE),14(TRNB),15(LOG),         E.2********
01BD 0DF0000020A90051             C17(GPROUT),24(R1)                                     E.2********
                   *                                                                     E.2********
                   *      GET MS RESULT BY SUM OF Y2 AND FIRST QUOTIENT,(OP/Y2).         E.2********
                   *                                                                     E.2********
                   SQ40   GEN     /N(SQ41),12(A$GPR),24(RC),11(B$GPR),23(R8),            E.2********
01BE 0DF80000391008C             C14(ADD),17(GPROUT),13(OPROUT)                         E.2********
                   *                                                                     E.2********
                   *      INCLUSIVE OR LS AND RIGHT BYTE MS TO SIMULATE SHIFT 8.         E.2********
                   *                                                                     E.2********
                   SQ41   GEN     /N(SQ42),12(A$GPRL),24(R1),11(B$SPEC),23(ORLZ),        E.2********
01BF 0E00000030110071             C14(OR),17(GPROUT)                                     E.2********
                   *                                                                     E.2********
                   *      RIGHT SHIFT MS BY 9,(THROUGH BYTE SWAP).                       E.2********
                   *                                                                     E.2********
                   SQ42   GEN     /N(SQ43),11(B$SPEC),23(OLSE),14(TRNB),15(LOG),         E.2********
01C0 0E08000023A80050             C13(OPROUT)                                            E.2********
                   *                                                                     E.2********
                   *      DOUBLE SHIFT OPR AND R1 TO COMPLETE 9 PLACE SHIFT              E.2********
                   *                                                                     E.2********
                   SQ43   GEN     /N(SQ44),12(A$GPRR),SH3,24(R1),14(TRNA),15(LOG),       E.2********
01C1 0E10000018F9B301             C17(GPROUT),18(SHFTOP),20(RSHT),XF2                    E.2********
                   *                                                                     E.2********
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                     1978  *       CLEAR SIGN BIT OF LS RESULT WORD; RESTART PIPELINE.
                     1979  *       ALLIGN MS FOR COMBINATION WITH EXPONENT .
                     1980  *
                     1981  SQ44    GEN      /N(SQ45),12(A$GPRR),SH4,24(R1),14(TRNA),15(LOG),
01C2 0E18040418F9840 1982                   C17(GPROUT),10(IF$P),6(MEMC),18(SHFTOP),20(LFT)
                     1983  *
                     1984  *       COMBINE MS RESULT WITH EXPONENT
                     1985  *
                     1986  SQ45    GEN      /N(SQ46),12(A$GPR),24(RA),11(B$SPEC),23(ORZF),
01C3 0E2000002011006A 1987                  C14(OR),17(GPROUT)
                     1988  *
                     1989  *       CLEAR SIGN BIT
                     1990  *
                     1991  SQ46    GEN      /N(SQ47),12(A$GPRR),SH4,24(RA),14(TRNA),15(LOG),
01C4 0E28000018F9040A 1992                  C17(GPROUT)
                     1993  *
                     1994  *       SETUP RESULT AND EXIT BACK TO ROM
                     1995  *
                     1996  SQ47    GEN      /P(SS2M),10(PJMP),SF0,TF0,11(B$GPR),23(RA),
01C5 0490000180A900A0 1997                  C14(TRNB),15(LOG),17(GPROUT),24(R0)
                     1999  *
                     2000  *       INDEX AND PERFORM OPERATION
                     2001  *
                     2002  *       COMPUTES EFFECTIVE MEMORY ADDRESS FROM INDEX AND BASE;
                     2003  *       STORES IT AS OPERAND ADDRESS OF FOLLOWING INSTRUCTION.
                     2004  *
                     2005  *       CALLING SEQUENCE:
                     2006  *
                     2007  *               BCS    IOP1
                     2008  *               DATA : INDEX ADDR
                     2009  *               DATA : ARRAY BASE ADDR
                     2010  *                -   : FOLLOWING INSTR , FIRST WORD
                     2011  *                -   : SECOND INSTR WORD (REPLACED BY EFFEC ADDR)
                     2012  *
                     2013  *       NOTE:   BOTH INDEX ADDRESS AND ARRAY BASE ADDRESS MAY
                     2014  *               BE INDIRECT.
                     2015  *
                     2016  *       REG USAGE:
                     2017  *               RA - INDEX VALUE STORAGE
                     2018  *               OPR - EFFECTIVE ADDR STORAGE
                     2019  *               RB - COPY OF OPR ON EXIT
                     2020  *
                     2021  *
                     2022  *
                     2023  *
                     2024  *       WAIT FOR COMPLETION OF INDEX VALUE FETCH;
                     2025  *       START FETCH OF ARRAY BASE ADDRESS;
                     2026  *
                01C6 2027  IORG1   EQU      *               SAVE POSITION
0181                 2028          ORG      SQ1+1           PLACE MICRO IN FIELD SEL TABLE
0181 0BCS040484000000 2029  IOP3    GEN      /N(IOP4),6(MEMC),10(OF$P),13(INCP)
                     2030  *
                     2031  *       SAVE INDEX VALUE; ADVANCE P TO FOLLOWING INSTR.
                     2032  *
0179                 2033          ORG      X'179
                     2034  IOP4    GEN      /*,11(B$SPEC),23(MIR),14(DECB),12(A$SPEC),22(ADRES),
0179 0BD000002491021A 2035                  C17(GPROUT),24(RA),13(INCP)
                     2036  *
                     2037  *       WAIT FOR COMPLETION OF BASE ADDRESS FETCH
                     2038  *
017A 0BD8000080000000 2039  IOP5    GEN      /*,6(SPEC),10(WAITMD)
                     2040  *
                     2041  *       TEST IF BASE ADDRESS HAS INDIRECT BIT SET;
                     2042  *       IF SO, USE IT AS INDIRECT ADDRESS AND LOOP TILL END OF CHAIN.
                     2043  *       SET EFFECTIVE ADDR = BASE ADDR +(2*INDEX)
                     2044  *
                     2045          GEN      /T(IOP5,IOP7),5(TT),7(MIRS),6(TESTT),10(OF$MIR),
                     2046                   C12(A$GPRL),24(RA),11(B$SPEC),23(MIR),14(ADD),
017B 6BD02EC6B390001A 2047                  C13(OPROUT)
                     2048  *
                     2049  *       START STORE OF EFFECTIVE ADDRESS INTO SECOND WORD
                     2050  *       OF FOLLOWING INSTRUCTION.
                     2051  *
017C 0BE80403080600004 2052  IOP7    GEN      /*,6(MEMC),10(OS$ALU),12(A$P),14(INCA),16(CRY1)
                     2053  *
                     2054  *       SETUP EFFECTIVE ADDR FOR STORAGE;
                     2055  *       WAIT FOR STORE TO COMPLETE;
                     2056  *       START FETCH OF FOLLOWING INSTR;
                     2057  *       EXIT THROUGH ROM STANDARD STATE
                     2058  *
                     2059          GEN      /P(SS2M),7(PJMP$),6(MEMC$),TF0,10(IF$P),
017D 049009042QA9000R 2060                  C11(B$SPEC),23(OPR),14(TRNR),15(LOG),17(GPROUT),24(RB)
01C6                 2061          ORG      IORG1           RESTORE LOCATION
                     2063  *
                     2064  *       FOLLOWING IS FIELD SELECT TABLE USED BY BCS X'17;
                     2065  *       CHOOSES BETWEEN $DO PROCESSING AND MATH/SQRT/INDEX;
                     2066  *
                     2067  *
                     2068  *       ENTRY FOR $DO WITH INCREMENT = 1
                     2069  *       SET RF = 1; ENTER INTO DO LOOP.
                     2070  *
                     2071  $DOIN1  GEN      /N(VALUE),12(A$SPEC),22(AZERO),14(INCA),16(CRY1),
01C6 0338000080070100F 2072                 C17(GPROUT),24(RF),10(WAITMD),6(SPEC)
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                        2073  *                                                                    E.2*********
                        2074  *       FIRST MICRO - MATH/SQRT/INDEX.                               E.2*********
                        2075  *       BEGIN FETCH OF SECOND OPERAND                                E.2*********
                        2076  *       FIELD SELECT TO CHOOSE MULT/DIVIDE OR OTHERS                 E.2*********
                        2077  *                                                                    E.2*********
01C7 090A8406800000002078             GEN     /F(IAR1),10(OF$MIR),6(MEMC),FSA,2(1)               E.2*********
                        2079          END                                                             00 00801
SYMBOLS
001D $DO      0064 $DO1     01C6 $DOIN1  0000 A$GPR    0002 A$GPRL
0003 A$GPRR   0001 A$P      0000 A$SPEC  0009 ADD      0044 ADDR1
0072 ADDR2    00B2 ADDR3    0114 AIF1    011C AIF2     011D AIF3
011E AIF4     0008 ALUC     0006 ALUD    0007 ALUS     0009 ALUZ
000B AND      0002 AONE     0002 AONES   0001 AZERO    0000 B$GPR
0001 B$SPEC   0007 BS$ALU   000F BS$MIR   0003 BS$OVR   000B BS$P
00E2 CBS      00CF CBS0     00D5 CBS1    00D0 CBS10    00DE CBS11
00DF CBS12    00E4 CBS13    00E0 CBS14   00E1 CBS15    00D7 CBS16
00D3 CBS17    00D2 CBS18    00D4 CBS19   00D6 CBS2     00DA CBS3
00C0 CBS4     00DB CBS5     00DC CBS6    00DD CBS7     00D8 CBS8
00D9 CBS9     0020 COMPOP   0003 CRY1    000F DECA     0009 DECB
0005 DECOD$   0004 DECODE   009D DECTOS  0030 DIV      002B DIV0
0026 DIV1     002A DIV10    0033 DIV12   0034 DIV13    0031 DIV14
0032 DIV15    0027 DIV16    002E DIV17   0033 DIV18    0035 DIV18A
002C DIV19    0021 DIV2     0024 DIV4    0025 DIV5     002F DIV7
0029 DIV7A    0028 DIV9     0063 DO3     005F DOSE1    014C DVORG1
015B DVORG2   0006 EOR      003A FAULT   00A6 FAULT1   00A5 FAULTA
004F FLOAD    0050 FLOAD1   004E FLOAD2  0051 FLOAD3   0059 FMOVE
005B FMOVE1   005A FMOVE2   005C FMOVE3  0048 FORTS1   0049 FORTS2
004C FORTS3   0047 FORTS4   004B FORTS5  004D FORTS6   0060 FORTS7
0071 FORTS8   004A FORTS9   0044 FORTSE  0055 FSTOR    0056 FSTOR1
0054 FSTOR2   0057 FSTOR3   0061 FSTOR4  0003 FT       0001 GPROUT
000D GPRS     0124 IAORG1   016A IAORG2  0120 IAR1     0122 IAR2
0123 IAR3     011F IAR4     0124 IAR5    0125 IAR6     0127 IAR7
016A IAS2     016B IAS3     016C IAS4    016C IAS5     016D IAS6
0001 IBR$I    016F ICMP     0170 ICMP1   0171 ICMP2    0172 ICMP3
0173 ICMP4    0174 ICMP5    0175 ICMP6   0176 ICMP7    0178 ICMP9
0133 IDV1     0155 IDV10    0156 IDV11   0157 IDV12    0158 IDV13
014C IDV2     014E IDV20    015B IDV21   015C IDV22    015D IDV23
015E IDV24    015F IDV25    0160 IDV26   0161 IDV27    0162 IDV28
0163 IDV29    014D IDV3     0164 IDV30   0165 IDV31    0166 IDV32
0167 IDV33A   0168 IDV33B   0169 IDV34   014F IDV4     0150 IDV5
0151 IDV6     0152 IDV7     0153 IDV8    0154 IDV9     0159 IDVOF
015A IDVOF3   0004 IF$ALU   000C IF$MIR   0000 IF$OVR   0008 IF$P
0126 IMD1     0131 IMD10    0128 IMD2    012A IMD3     012B IMD4
012C IMD5     012D IMD6     012E IMD7    012F IMD8     0130 IMD9
0132 IMU1     013C IMU10    013D IMU11   013E IMU12    013F IMU13
0140 IMU14    0141 IMU15    0142 IMU16   0143 IMU17    0144 IMU18
0145 IMU19    0146 IMU20    0147 IMU21   0148 IMU22    0149 IMU23
014A IMU24    014B IMU25    0134 IMU3    0135 IMU4     0136 IMU5
0137 IMU6     0138 IMU7     0139 IMU8    013A IMU9     0000 INCA
0001 INCB     00A7 INCLR0   0073 INCLR1  0075 INCLRB   0004 INCP
00AA INCR0A   0072 INCR0B   00A9 INCR1A  0074 INCR1B   00A8 INCRBA
0076 INCRBB   0005 INCSC    009E INCTOS  0181 IOP3     0179 IOP4
017A IOP5     017C IOP7     0002 IOR     0106 IORG1    0001 IOSR
00E7 JAG1     00E8 JAG2     00EA JAG3    00E9 JAG4     00EB JAG5
00EC JAG6     0016 JIR1     011A JIR2    0006 KOUT     0000 LSI
006B LIM1     006A LIM2     006D LIM3    006C LIM4     0069 LIMIT
0003 LIT      0001 LOG      00E3 MBS     00B3 MBS1     00B7 MBS10
00BD MBS11    00BE MBS12    00C7 MBS13   00BC MBS14    00CE MBS15
00C9 MBS16    00CA MBS17    00C5 MBS18   00CB MBS19    00B4 MBS2
00B6 MBS20    00CC MBS21    00CD MBS22   00C4 MBS23    00C6 MBS24
00BA MBS25    00B5 MBS3     00B2 MBS4    00B7 MBS5     00B9 MBS6
00B9 MBS7     00C8 MBS8     00BB MBS9    009F MCTOS    00A1 MCTOS1
00A2 MCTOS2   00A3 MCTOS3   00A4 MCTOS4  00AF MCTOSA   0039 MCTOSB
00A0 MCTOSX   0001 MEMC     0008 MEMCS   0001 MIR      000B MIRS
0002 MSK      0041 MUL      0037 MUL1    0043 MUL12    0042 MUL13
00B1 MUL2     003B MUL3     0038 MUL4    0070 MUL5     003D MUL6
0036 MUL8     003F MUL9     00B0 MULA    006F NEXT     000E NORM
0000 NOTA     0005 NOTB     0005 OF$ALU  0003 OF$MIR   0001 OF$OVR
0009 OF$P     0005 OLSE     0003 ONES    0000 OPR      0003 OPROUT
0001 OR       0007 ORL2     0004 ORSE    0006 ORZF     0006 OS$ALU
000E OS$MIR   0002 OS$OVR   000A OS$P    0000 OVFL     0200 P
0200 PAGE     0003 PJMP     0004 PJMP$   0036 POP      0087 POPD
0038 POPDA    0001 POPDSL   00F1 POPJ1   00EF POPJ2    00F2 POPJ3
00F4 POPJMP   0001 POUT     00F0 PSHJ1   00F3 PSHJ2    00F4 PSHJ3
00F6 PSHJ4    00F5 PSHJ5    00F7 PSHJ6   0002 PUSH     009A PUSH1
009B PUSH2    0090 PUSH3    0085 PUSHD   0090 PUSHD1   0084 PUSHS
000F QUOS     0000 R0       0001 R1      0002 R2       0003 R3
0004 R4       0005 R5       0006 R6      0007 R7       0008 R8
0009 R9       000A RA       000B RB      000C RC       000D RD
000E RE       00F8 REL1     0101 REL10   0102 REL11    0103 REL12
0104 REL13    0105 REL14    0106 REL15   0107 REL16    0109 REL17
00F9 REL2     010A REL20    00FA REL3    00FB REL4     00FC REL5
00FD REL6     00FE REL7     00FF REL8    0100 REL9     010B RJ3
016E RETURN   000F RF       0001 RGHT    0105 RGT      010C RJT
0119 RMET     0118 RNOT     0004 ROVFL   0000 S$ALU    0009 S$OVF$
0006 S$OVFL   0001 S$SHFT   0080 SADD    007B SADD3    007C SADD4
007D SADD5    007E SADD6    00AC SADDA   0002 SCOUT    0098 SDIV
0098 SDIV10   0095 SDIV5    0096 SDIV8   0097 SDIV9    0098 SDIVY
0091 SEXIT    0000 SFTC     0000 SHFA    000A SHFT     0001 SHFT2
0093 SMU13A   0094 SMUL1    0082 SMUL    0088 SMUL12   0089 SMUL13
008A SMUL3    0083 SMUL4    0085 SMUL6   0087 SMUL7    008E SMUL8
008F SMUL9    0002 SOVFL    0000 SPEC    0106 SQ1      010B SQ10
018E SQ11     018F SQ12     0190 SQ13    0191 SQ14     0192 SQ15
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0193 SQ16    0194 SQ17    0195 SQ18    0196 SQ19    0183 SQ2
0197 SQ20    0198 SQ21A   0199 SQ21B   019A SQ21C   019B SQ21D
019C SQ21E   019D SQ21F   019E SQ21G   019F SQ21H   01A0 SQ22
01A1 SQ23    01A2 SQ24    01A8 SQ25A   01A9 SQ25B   01AA SQ25C
01AB SQ25D   01AC SQ25E   01AD SQ25F   01AE SQ25G   01AF SQ25H
01B0 SQ26    01B1 SQ27    01B2 SQ28    01B3 SQ29    0184 SQ3
01B4 SQ30    01B5 SQ31    01B6 SQ32    01B7 SQ33    01B8 SQ34
01B9 SQ35    01BA SQ36    01BB SQ37    01BC SQ38    01BD SQ39
0185 SQ4     01BE SQ40    01BF SQ41    01C0 SQ42    01C1 SQ43
01C2 SQ44    01C3 SQ45    01C4 SQ46    01C5 SQ47    0188 SQ5
0189 SQ6     018A SQ7     018B SQ8     018C SQ9     0121 SQIN1
0182 SQIN2   0186 SQOVF   0187 SQOVF1  013E SS1M    0092 SS2M
002D SS3M    0081 SSUB    007F SSUB3   0089 SSUB4   00AD SSUBA
0004 SSW1    0003 SSW2    0002 SSW3    000D STACK   0077 STACK1
0078 STACK2  0079 STACK3  007A STACK4  00AB STACK5  0019 STACKS
0003 STAT    00E6 STKJ1   00ED STKJ2   00EE STKJ3   0006 SUB
0002 TCB     0002 TESTF   0003 TESTT   0005 TFIR    0014 TFR1
011B TFR2    0111 TJEQ    0113 TJGE    0117 TJGT    0116 TJLE
0112 TJLT    0110 TJNE    000F TRNA    000A TRNB    0002 TT
0066 VAL2    0068 VAL3    0067 VALUE   0065 VALUX   0001 WAITMD
0062 YD01    0070 YD02    0003 ZERO
 0 ERRORS ASSEMBLY COMPLETE

  452  $DD1       482
 2071  $DDIN1     825
    0  A          127
   21  A$GPR      237   296   299   306   309   314   332   363   369
                 374   395   417   420   460   464   470   477   482
                 522   524   551   553   556   560   572   576   582
                 584   589   593   595   598   634   640   642   654
                 656   668   670   682   694   703   705   711   713
                 736   743   749   755   757   770   779   788   798
                 809   844   919   960   966  1049  1054  1069  1084
                1095  1135  1136  1213  1331  1364  1382  1392  1403
                1437  1449  1487  1566  1575  1634  1640  1656  1669
                1676  1681  1691  1738  1767  1783  1806  1879  1881
                1883  1885  1887  1889  1916  1951  1960  1986
   22  A$GPRL    1607  1614  1619  1790  1965  2046
   23  A$GPRR     637   659   680   683   685   697   700   708   740
                 761   768   776  1626  1812  1818  1824  1826  1831
                1921  1975  1981  1991
   24  A$P        415   494   796   953  1131  1133  2052
   25  A$SPEC     235   288   294   372   542   816   819   927   933
                 946  1112  1114  1117  1141  1147  1161  1244  1289
                1342  1444  1553  1592  1597  1665  1750  1760  1762
                1943  2034  2071
    0  AA0        210   215
    0  AA1        194   195   198   208   233   234   239   245   247
                 579   615
    0  AA4        176   600
    0  AA8        588
    0  AAE        191   197   240
    0  AAF        192   211   246
   12  ADD        238   416   465   523   557  1132  1134  1383  1615
                1635  1768  1879  1881  1883  1885  1887  1889  1917
                1961  2046
  249  ADDR1      286
  485  ADDR2      497
  616  ADDR3      632
 1131  AIF1      1161
 1167  AIF2      1131  1133  1172
 1172  AIF3      1167
 1178  AIF4      1172
    0  AK2        531   532   533   534   535   536   537   538   539
                 550   554   565   569
    0  AK9        556
   15  ALUS       452   476   484   592   595   656   670   705   713
                 758   768   858   953  1063  1100  1105  1129  1130
                1492  1582  1742  1806  1906
   16  ALUZ       641   643   749   862  1068  1089  1127  1128  1337
                1370  1398  1408  1444  1456  1571  1660
   17  AND        635  1670  1784
   18  AONE       286   294
   19  AONES      819   927  1141  1161  1593  2034
   20  AZERO      288   372   542   816   933   946  1112  1114  1117
                1147  1244  1289  1342  1444  1553  1597  1665  1750
                1760  1762  1943  2071
    0  B           98
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                1960  1996
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                 773   782   786   789   875   912   926   932   940
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 786  CBS14         782
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 747  CBS17         757
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 203  DIV10         200   201   203
 215  DIV12         207
 216  DIV13         207
 212  DIV14         216
 214  DIV15         216
 198  DIV16         212   214
 208  DIV17         212   214
 193  DIV18         195
 217  DIV18A        193
 206  DIV19         203
 191  DIV2          205
 194  DIV4          192   196
 195  DIV5          192   196
 209  DIV7          194   217
 201  DIV7A         209
 200  DIV9          201
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1520  DVORG2       1524
   0  E             101
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 395  FMOVF2        398
 401  FMOVF3        395
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  0   FSF      1837  1871
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368   FSTOR1    366
363   FSTOR2    368
371   FSTOR3    363
419   FSTOR4    374
 38   FT        452   476   510   592   642   656   670   705   713
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 39   GPROUT    236   293   297   300   303   338   341   346   399
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1220  IAR4      1213
1227  IAR5      1220
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1575  IDV31     1571
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1592  IDV33B    1582
1597  IDV34     1586  1592
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1257   IMD3     1244  1251
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1267   IMD5     1262
1273   IMD6     1267
1279   IMD7     1273
1284   IMD8     1273  1279
1289   IMD9     1284
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1376   IMU15    1370
1382   IMU16    1370  1376
1387   IMU17    1382
1392   IMU18    1387
1398   IMU19    1392
1403   IMU20    1398
1408   IMU21    1403
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                1889
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               1975  1981  1991  1997  2060
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713   MBS22     711
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694   MBS24     656   670   705   713
659   MBS25     689
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654   MBS6      651
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700   MBS8      656
664   MBS9      642
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593   MCTOS3    235
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587   MCTOSX    586
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234   MUL4      613
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241   MUL6      240
231   MUL8      242

243   MUL9      231
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 1981  1986  1991  2029  2071

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 933  PSHJ2     926
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 951  PSHJ5     945
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 577  PUSH2     577
 578  PUSH3     578
 579  PUSHJ1    579
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               1763  1838  1907  1916  1929  1938  1944  1951  1956
               1965  1975  1981
 90  R2          634   640   642   656   659   670   697   700   705
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               1837  1900  1926  1939  1960
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