UNIVERSAL ASSEMBLER VERSION 2.2.B JULY 29, 1979 (IN-HOUSE)

```
COMMAND LINE WAS: SNAP3 PROC14G3.PROD,,,PROC14G3:GBQLX

INCLUSION A: PROCINC/TXT:DR0
INCLUSION B: PROC14G3/LIB:DR0.PMACMIC
INCLUSION C: PROC14G3/LIB:DR0.GMACROZ
INCLUSION D: PROC14G3/LIB:DR0.PROCEQUS
INCLUSION E: PROC14G3/LIB:DR0.BDEF1800
INCLUSION F: PROC14G3/LIB:DR0.MDEF1800
INCLUSION G: PROC14G3/LIB:DR0.PORTEQUS
INCLUSION H: PROC14G3/LIB:DR0.PORTASGN
INCLUSION I: PROC14G3/LIB:DR0.PROCPARM

PROGRAM NAME: PROD

PROGRAM ADDRESS BLOCKS:     010000   /ABSOLUTE/  SIZE=000000  (ABS)
                            167400   /SYSIVR/    SIZE=000400  (ABS)
                            170000   /SYSROM/    SIZE=000047  (ABS)
                            002000   /PRODL/     SIZE=002000  (ABS)
                            000000   /PRODP/     SIZE=004000  (REL)

EXTERNAL DEFINITIONS:

FETCHRW   002000    FETCHW    002003    FETCH     002005    FETCHN    002010
FETCHL    002013    SRVDO     002645    CALLCC    002026    NOJ       002444
CALL      002032    MEMPF$    002221    PCMOD     002100    PSHSTO    002054
PUSH      002111    PUSHI     002117    EIROJ     002142    JUMP      002447
RETURN    002152    RETCC     002147    RETS      002206    POPSTO    002155
POP       002212    STKS      002277    RIN16     003202    SYSRETO   002372
SIRO      002421    SIRX      002430    JUMPCC    002441    LD6       002467
LD7       002502    L7S       002523    LDS       002537    AP4       002542
AP7       002551    APS       002565    SRVRPT    002636    SRVNXT    002643
SRVRTW    002653    BEEP      002703    CLICK     002715    AC$DO     002724
BT        003000    RIN256    003105    RIND      003210    RINST     003113
BCP       003123    BFSB      003215    BFAC      003221    BFS       003273
SLC       003341    SRC       003350    SRE       003361    CCS       003400
PLR       003405    PSR       003427    INCPA     003444    INCP      003451
DECPA     003473    DECP      003500    DECX      003522    INCX      003525
DS        003631    DLHL      003633    DL        003637    BRL       003714
EI        003730    DI        003741

EXTERNAL REFERENCES (UNDEFINED SYMBOLS):

SCROMLI   SCRAMI    SYSRET1   IVIOL$    DL$DO     SCDON     SCLST

UNUSED LABELS:

BTR
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1.                . 2.14.G  HJS 79 NOV  30    INSERT TIMING FOR THIS VERSION
2.                . 2.14.F  HJS 79 OCT   8    CHANGE OVER TO HONEYWELL BEEPER (SOUNDS BETTER)
3.                . 2.14.E  HJS 79 AUG  13    FINAL CLEANUP BEFORE WORKING VERSION
4.                . 2.14.D  HJS 79 AUG  10    FIX THE BUGS STILL LEFT
5.                . 2.14.C  HJS 79 JUL  27    CLEANUP NEW CODE BEFORE TEST IT
6.                . 2.14.B  HJS 79 APR  17    RE-ORDER ROUTINES TO FIT BETTER
7.                . 2.14.A  HJS 79 APR   2    START MODIFICATIONS FOR INTERNAL RIM 3800
8.                *
9.                . 2.13.B  HJS 79 FEB   7    ENABLE COMM ON 3800 PROCESSORS
10.               . 2.13.A  HJS 79 JAN  22    FIX REGS BUG TO ALLOW ACCESS TO PROTECTED STACK
11.               *
12.               . 2.12.C  HJS 78 OCT  12    CORRECT MEMORY FAULTS SO PC MATCHES 6600 PC
13.               . 2.12.A  HJS 78 SEP  05    REFORMAT, RE-COMMENT, AND FIX STACK FOR ACCESS
14.               .   12                      SET VERSION NUMBERS TO MATCH ? FROM DEBUG
15.               *
16.               . 2.9.L HJS   78 JUL  18    FIX ANOTHER HONEYWELL BUG
17.               . 2.9.K HJS   78 JUN  16    FIX BUG INTRODUCED IN HONEYWELL CODE (TZ TO FZ)
18.               . 2.9.K HJS   78 APR  23    SPLIT PROC, MAKE RELOCATABLE, CHANGE APF, ADD AML
19.               . 2.9.J HJS   78 MAR  20    RESTRUCTURE INTERRUPT SEQUENCE & MINOR MODS
20.               . 2.9.I HJS   78 FEB  27    CORRECT 9.H FOR FAULT CLEANUP
21.               . 2.9.H HJS   78 FEB  16    EVERYBODY MEMPF'S, KEYBOARD SCAN, & SIR CHANGE
22.               . 2.9.G HJS   78 FEB   3    CORRECT TIMING, COMMENTS, & ADD POR TIMEOUT
23.               . 2.9.F HJS   78 JAN  11    FIXING MIN/MOUT TIMINGS
24.               . 2.9.E HJS   78 JAN   4    TESTING REPEATED KEYIN CONTROLS
25.               . 2.9.D HJS   77 DEC  21    CORRECT STL INSTRUCTION
26.               . 2.9.C HJS   77 DEC  13    BACK OFF FROM KBD RPT & RE-DO STL FOR TIMING
27.               . 2.9.B HJS   77 NOV  20    INCLUDE TIMINGS AS CALCULATED & FIX MINOR BUGS
28.               . 2.9.A HJS   77 NOV  14    CHANGE KEYBOARD CODE TO AID REPEATED KEY CONTROL
29.               *
30.               . 2.8.B HJS   77 SEP  22    MTI CHANGE SO LENGTH IS 2 BYTE NUMBER
31.               . 2.8.A HJS   77 SEP  19    MTI CHANGE TO ALLOW MFRPT ON ANY INTERRUPT
32.               *
33.               . 2.7.  HJS   77 SEP   7    MINOR BUG-FIX AND OPTIMIZATION FOR RELEASE
34.               *
35.               . 2.H.B HJS   77 AUG  31    MTI SPECIAL VERSION
36.               *
37.               . 2.5.C HJS   77 AUG  16    UPDATE COMMENTS ON THE CODE
38.               . 2.5.B HJS   77 JULY 13    CORRECTED NAMES FOR COM REGISTERS
39.               . 2.5.A HJS   77 JULY 12    UP TO NEXT NEW VERSION NUMBER
40.               *
41.               . 2.4.B HJS   77 JULY 12    FIXED ILLEGAL MAR CHANGE IN REGL RETURN TO FETCH
42.               .                           FIXED FILE TO CONFORM TO VRP FORMAT (A LITTLE)
43.               . 2.4.A HJS   77 JULY 7     INITIAL PRE-RELEASE OF THE MICRO-CODE
```

```
44.                                     *
45.                                     INC     PROCINC
46.                                     *
47.  002000                             PRODL   ORG     PROD            LOGICAL SPACE DEFINED IN PLACE
48.  000000                             PRODP   ORG     0               PHYSICAL SPACE RELOCATABLE
49.  002000                             PRODL   USE     PRODL           USE THEM BOTH
50.  000000                             PRODP   USE     PRODP           PUT THE CODE IN PHYSICAL SPACE
51.  002000L                            PRODP   LOC     PRODL,2         WITH ADDRESSES IN LOGICAL SPACE
```

Fetchws: MWAIT, IGNPF2
LDPP MODW, PSWI
TSTIT, SW64K
BAA FETCH, T2
~~LDIR MARON, SYSEN~~
LDX BR2MAH
LDPK STW, SLSTKPE
BAA FETCH

DATAPOINT CONFIDENTIAL INFORMATION - SEE PAGE 1


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                                        . FETCH NEXT INSTRUCTION
54.                                     *
55.                                     . GET NEXT INSTRUCTION IN SEQUENCE AND GO TO IT
56.                                     . UNLESS SERVICE REQUEST INTERFERES (RETURNS TO SRVEND SO CODE CAN NEVER
57.                                     . BE LOCKED OUT!)
58.
59.  002000L 11000100 11111111          FETCHRW:  MWAIT     ,IGNORE         ENTRY IF WRITE OPERATIONS & TEMPORARY MODW
60.                                     . 3.10
     002001L 00110001 11011100                    LDPP      MODW,PSWI       RESTORE CORRECT PROTECTION BEFORE FETCH
     002002L 00110111 00000100
62.                                     .                                   (EXTRA MWAIT AS FAST AS BRANCH AROUND IT)
63.  002003L 11000100 11111100          FETCHW:   MWAIT     ,MEMPF2         ENTRY IF WRITE OPERATIONS LAST
     002004L 11000111 01101111
64.                                     . 2.70
65.  002005L 00110001 11001001          FETCH:    DLDX      PC2MR,,IMAR     ENTRY IF MAR MUST BE LOADED (NORMAL)
     002006L 00110001 11101000
     002007L 00110111 00001100
66.                                     . 2.50
67.  002010L 00110001 10001001          FETCHN:   DLDX      MR2PC,,SMR      ENTRY FOR JUMP OR CALL (P.C. OK?)
     002011L 00110001 10101000
     002012L 00110111 01000111
68.                                     . 2.05
69.  002013L 01010001 00000000          FETCHL:   LDPI      LIMP,0          IMPLICIT REGISTER ZERO
     002014L 00110111 00000001
70.                                     . 1.60
71.  002015L 00110001 00110000                    TSTPT     FI,SRVREQ       SERVICE REQUEST?
72.  002016L 11010010 01011010                    BRA       SRVDO,FZ        YES, DO IT & SAVE MAR ETC. FOR RETURN
73.
74.  002017L                             SRVEND                            SERVICE RE-ENTRY, IMP, MAR & PC ALL OK?
75.  002017L 11000100 11110000          FETLIMP   MWAIT     ,MEMPF2         ERROR IF MEMORY FAULT
     002020L 11000111 01101111
76.                                     . 1.10
77.  002021L 00110111 00001100                    STB       IMAR            !! SPEEDUP FOR THOSE THAT CAN USE IT !!
78.  002022L 00110001 00110110                    LDPP      LIREG,MDR       LOAD INSTRUCTION REGISTER
     002023L 00110111 00000000
79.  002024L 00111001 00110100          SRVID     BRPX      IDCOD           GO TO THE ROUTINE
     002025L 10101111 00110011
80.
81.                                     . NOTE: PC LEFT POINTING AT THE INSTRUCTION BYTE JUST FETCHED
82.                                     .       MAR LEFT POINTING AT THE NEXT BYTE SO IF MULTI-BYTE
83.                                     .       INSTRUCTION, CAN START WITH AN SMR FOR A LITTLE SPEEDUP.
```

```
                        . SUBROUTINE CALL AND STACK PUSH

                                                                        CALL POP:
                        *                                               BRA POPR,F@,IZ
                        CALLCC:
                        .       (    1C2)  CCC.LSB.MSB      CONDITIONAL CALL
                        . 7.90 (1.05 NOT TAKEN)             (SP-2 | SP-1) <- PC
                        .       (    102)  CFC.LSB.MSB      FALSE CARRY
                        .       (    112)  CFZ.LSB.MSB      FALSE ZERO (.NE.)
                        .       (    122)  CFS.LSB.MSB      FALSE SIGN (.GE.)
                        .       (    132)  CFP.LSB.MSB      FALSE PARITY (EVEN)
                        .       (    142)  CTC.LSB.MSB      TRUE CARRY
                        .       (    152)  CTZ.LSB.MSB      TRUE ZERO (.EQ.)
                        .       (    162)  CTS.LSB.MSB      TRUE SIGN (.LT.)
                        .       (    172)  CTP.LSB.MSB      TRUE PARITY (ODD)

                        . 5.45  (111 102)  UR                USER RETURN

002026L 11001000 10011100       BRA      USERET,F@,IZ       USER RETURN, NOT A CALL!
002027L 00110001 00110001       TSTIP    ,STUSCF,STATUS     IS USER CC CORRECT?
002030L 01000101 00000001
002031L 11010011 11011011       BRA      NOJ,TZ             NO, DO NOJ NOT A RETURN

                        *
002032L                 CALL:
                        .       (    106)  CALL.LSB.MSB     UNCONDITIONAL CALL
                        . 7.45                              (SP-2 | SP-1) <- PC
                        .                                   SP <- SP - 2; PC <- NN
                                                            BRA POPR1, F@, IZ
002032L 00110111 01000111       STB      SMR
002033L 01010001 00001001       LDPI     LIMP,PCL           PC TO BE PUSHED ONTO THE STACK
002034L 00110111 00000001
002035L 11000100 11100010       MWAIT    ,MEMPF$
002036L 11000111 01101110
002037L 00110111 00001100       STB      IMAR
002040L 00110001 00110110       LDRP     TEMPL,MDR          SAVE LSB
002041L 01101111 11110010
002042L 00110111 01000111       STB      SMR
002043L 11001110 11111111       MWAIT    NOOP,MEMPF$
002044L 11000100 11011011
002045L 11000111 01101110
002046L 00110001 00110110       LDRP     TEMPH,MDR          SAVE MSB
002047L 01101111 11110001
002050L 00110111 00001100       STB      IMAR               POINT MAR TO THE NEXT INSTRUCTION
002051L 00110001 10001001       DLDX     MR2PC              SO PUSHED P.C. IS CORRECT
002052L 00110001 10101000
002053L 01010001 10111111       BAL      ,PCMOD
```

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                                . SUBROUTINE CALL AND STACK PUSH
121.                            +
122.  002054L 01101111 10110000  PSHSTO:  BAS     LINK,CC          (2.80) IN-PAGE ENTRY TO PUSH
123.  002055L                   PSHSTK                           OFF-PAGE ENTRY (LINK RETURN PRE-LOADED)
124.                            . 2.70   + 0.20 INTO MEMORY WAIT  MUST HAVE CARRY CLEAR TO USE THIS ENTRY
125.
126.                            .        NOTE:  CAN NOT PARITY CHECK IN HERE OR LOST FOREVER WITH
127.                            .               MEMPFS & SYS CALL & PUSH !!!
128.
129.  002055L 00110001 11011100          DOPIP   MODW,ND,-1-SWUSER,PSWI  ALLOW STACK IN ACCESS PROTECTED MEM
      002056L 01010101 11111011
      002057L 00110111 00000100
130.  002060L 00110001 11101010          LDX     SP2MRH           POINT TO MEMORY STACK
131.  002061L 00110001 11011011          DOTIP   ,SB,2,SPIL       UPDATE THE SP
      002062L 01010100 00000010
132.  002063L 01010011 01000000          DOPI    SPOL,OR,0100     MAKE SURE EVEN & WRAP AROUND (MOD 32/64
      002064L 00110111 10001011
133.  002065L 00110111 11000000          LDPT    MAROL            SAVE UPDATED LSB
134.  002066L 00110001 11011111          LDPP    MDW,IMPI         STORE LSB THERE
      002067L 00110111 00101001
135.  002070L 00110111 00001001          STB     DIMP
136.  002071L 00110001 11011111          LDTP    IMPI             PRE-LOAD MSB DATA TO WRITE
137.  002072L 11000100 11000101          MWAIT   ,MEMPFPS         *** LET THE CALLER WORRY ABOUT IT ***
      002073L 11000111 11000000
138.  002074L 00110111 00001100          STB     IMAR             NOW POINT & DO THE MSB TO FINISH OFF
139.  002075L 11001111 11000001          DELAY   2
140.  002076L 00110111 00101001          LDPT    MDW

141.  002077L 11101111 00000000  MEMPFPS  BRR     LINK
142.                            .    *** NOTE ROUTINE CALLING PSHSTK OR PSHSTO MUST HAVE MWAIT ,ADDR ***
143.                            .    *** AND MUST RESTORE MODW FROM THE PSW ***
144.                            *
145.  002100L                   PCMOD:                           RETURN FROM PSHSTK AND SET NEW PC
146.                            . 1.60 (WITH MWAIT WITHOUT FETCHN)
147.
148.  002100L 11000100 10111111          MWAIT   ,MEMPFS
      002101L 11000111 01101110
149.  002102L 00110001 11011100          LDPP    MODW,PSWI        RESTORE CORRECT MODE
      002103L 00110111 00000100
150.  002104L 01110001 11110010          DLDPR   MARO,TEMP        LOAD UP SAVED P.C.
      002105L 00110111 11000000
      002106L 01110001 11110001
      002107L 00110111 11100000
151.  002110L 11001111 11110111          BRA     FETCHN           GO TO ADDRESS AT MACRO LEVEL
```

TSTIT ,SW64K
BRA PSHSTN,T2
LDPR STW,SSTKPE

TSTIT ,SW64K
BRA PCMODX,T2
LDPI STW,USTKPE

```
                        . SUBROUTINE CALL AND STACK PUSH
152.                    *
153.  002111L           PUSH:
154.                    . 4.05   (    070)  PUSH          (SP-1 | SP-2) <- HL; SP <- SP - 2
155.                    . 3.70   (062 070)  PUSH          BC
156.                    . 3.70   (174 070)  PUSH          DE
157.                    . 3.70   (022 070)  PUSH          XA
158.                                                      WS
159.  002111L 01010001 11111111            BRS     PSHSTK,F@,IZ,FETCHRW;CC REG PAIR SPECIFIED!
      002112L 01101111 10110000
      002113L 11001000 11010010
160.  002114L 01010001 00000110            LDPI    LIMP,URL        DEFAULT
      002115L 00110111 00000001
161.  002116L 11001111 11010010            BRA     PSHSTK
162.                    *
163.  002117L           PUSHI:
164.                    .        (    051)  PUSH.LSB.MSB  PUSH CONSTANT (ADDRESS?) ONTO STACK
165.                    . 6.20                            (SP-1 | SP-2) <- NN; SP <- SP - 2
166.                                BRA  LLOP, F@,IZ
167.  002117L 00110111 01000111            STB     SMR             GET THE IMMEDIATE VALUE
168.  002120L 01010001 00001111            LDPI    LIMP,IMPL       AND HIDING PLACE
      002121L 00110111 00000001
169.  002122L 11000100 10101101            MWAIT   ,MEMPF$
      002123L 11000111 01101110
170.  002124L 00110111 00001100            STB     IMAR
171.  002125L 00110001 00110110            LDPP    IMPO,MDR        GOT LSB
      002126L 00110111 10001111
172.  002127L 00110111 01000111            STB     SMR
173.  002130L 00110001 10001001            DLDX    MR2PC,,DIMP     SAVE THE UPDATED P.C.
      002131L 00110001 10101000
      002132L 00110111 00001001
174.  002133L 11000100 10100100            MWAIT   ,MEMPF$
      002134L 11000111 01101110
175.  002135L 00110001 00110110            LDPP    IMPO,MDR,IIMP   GOT MSB, POINT CORRECTLY FOR PUSH
      002136L 00110111 10001111
      002137L 00110111 00001000
176.  002140L 01010001 11111111            BRC     PSHSTO,,FETCHRW RETURN FROM PUSH TO FETCH WAIT
      002141L 11001111 11010011                                 WS

                                LLOP    BRA X   LLDBL
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                        . RETURN CODES USER & CONDITIONAL & REGULAR, AND  STACK POPPING
                        *CALL UK
                        EIROJ:
                        . 6.40   (062 050)  EUR             ENABLE INTERRUPTS & USER &
                        .                                   PC <- (SP+1 | SP); SP <- SP + 2
                        . 4.10   (111 050)  EJMP.LSB.MSB    ENABLE INTERRUPTS & PC <- NN

002142L 11011011 11011000           BRA     JUMP,T@,IO
                        *
                        USERET
                        . 6.40   (062 050)  EUR             ENABLE INTERRUPTS & USER &
                        .                                   PC <- (SP+1 | SP); SP <- SP + 2
                        . 5.45   (111 102)  UR              USER RETURN

002143L 00110001 11011100           DOPIP   PSWO,OR,SWUSER,PSWI SET USER MODE
002144L 01010011 00000100
002145L 00110111 10001100
                        .           STB     MODW            EXTERNALLY ALSO IN EMULATION AIDS
002146L 11001111 10010101           BRA     RETURN
                        *
002147L                 RETCC:
                        .           (   0C3) RET            CONDITIONAL RETURN
                        . 5.00 (0.45 NOT TAKEN)             PC <- (SP+1 | SP); SP <- SP + 2
                        .           (   003) RFC            FALSE CARRY
                        .           (   013) RFZ            FALSE ZERO (.NE.)
                        .           (   023) RFS            FALSE SIGN (.GE.)
                        .           (   033) RFP            FALSE PARITY (EVEN)
                        .           (   043) RTC            TRUE CARRY
                        .           (   053) RTZ            TRUE ZERO (.EQ.)
                        .           (   063) RTS            TRUE SIGN (.LT.)
                        .           (   073) RTP            TRUE PARITY (ODD)

002147L 00110001 00110001           TSTIP   ,STUSCF,STATUS
002150L 01000101 00000001
002151L 11000011 11110111           BRA     FETCHN,TZ
                        *
002152L                 RETURN:
                        . 4.65   (   007) RET              UNCONDITIONAL RETURN
                        .                                   PC <- (SP+1 | SP); SP <- SP + 2

002152L 01010001 00001001           LDPI    LIMP,PCL        POP STACK INTO PROGRAMME COUNTER
002153L 00110111 00000001
002154L 01010001 01111001           BAL     ,RETS           RETURN FROM POP TO SPECIAL STARTUP
```

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217.                                        *
218.  002155L 01101111 10110000    POPST0: BAS     LINK,CC          (3.65) IN-PAGE CALL
219.  002156L                      POPSTK                           POP THE STACK TO IMP AND IMP-1
220.                               . 3.55                           CARRY MUST BE CLEAR TO USE THIS ENTRY
221.
222.  002156L 00110001 11101010              LDX     SP2MRH         POINT INTO THE STACK AREA
223.  002157L 00110001 11011100              DOPIP   MODW,ND,-1-SWUSER,PSWI   ALLOW ACCESS TO PROTECTED MEMORY
      002160L 01010101 11111011              TSTIT   SW64K
      002161L 00110111 00000100              BRA     POPSTKN,TZ
                                             LDPR    STW,SSTKPE
224.  002162L 00110001 11001011 POPSTKN LDX     SP2MRL,SMR       (SAVE 150 N.SEC BY INVERTING ORDER)
      002163L 00110111 01000111
225.  002164L 01010101 10111111              DOTI    ,ND,-1-0100      TURN OFF WRAP-AROUND BIT
226.  002165L 01010010 00000010              DOTI    ,AC,2            SKIP TO NEXT ENTRY TO POP
227.                               .                                NOTE: (STKS) ASSUMES FALSE CARRY
228.                               .                                GENERATED HERE (TO SAVE WORD)
229.  002166L 01010011 01000000              DOPI    SPOL,OR,0100     SET BIT ON TO FINISH WRAP-AROUND
      002167L 00110111 10001011
230.  002170L 11000100 10000111              MWAIT   ,MEMPF$
      002171L 11000111 01101110
231.  002172L 00110111 00001100              STB     IMAR
232.  002173L 00110001 00110110              LDPP    IMPO,MDR         SAVE LSB DATA
      002174L 00110111 10001111
233.  002175L 00110111 01000111              STB     SMR,DIMP         GET MSB DATA
      002176L 00110111 00001001
234.  002177L 11000100 10000000              MWAIT   ,IGNORE          PUT MEMPF$ AFTER LDPP, BETTER STACK!
235.  002200L 00110001 11011100              LDPP    MODW,PSWI
      002201L 00110111 00000100
236.  002202L 00110001 00110110 POPSTKX —     LDPP    IMPO,MDR         SAVE MSB DATA
      002203L 00110111 10001111
237.  002204L 11100000 00000000              BRR     LINK,F@,MP
238.  002205L 11001111 01101110              BRA     MEMPF$           (AND DO A SLIGHT SPEEDUP)
239.                                        *
240.  002206L                      RETS:
241.                               . 0.65
242.
243.  002206L 00110001 11101000              DLRX    PC2MR,,SMR       LOAD THE MAR FROM P.C. VALUE (NO IMAR)
      002207L 00110001 11001001
      002210L 00110111 01000111
244.  002211L 11001111 11110100              BRA     FETCHL
245.                                        *
246.  002212L                      POP:
247.                               . 4.30   (    060)  POP           HL IS POPPED FROM STACK
248.                               . 3.95   (062 060)  POP           BC
249.                               . 3.95   (174 060)  POP           DE
250.                               . 3.95   (022 060)  POP           XA
251.                               .                                RP <- (SP+1 | SP); SP <- SP + 2
252.
253.  002212L 01010001 11111010              BRS     POPSTK,F@,IZ,FETCH,CC  IMP POINTS TO REG-PAIR ALREADY
      002213L 01101111 10110000
      002214L 11001000 10010001
254.  002215L 01010001 00000110              LDPI    LIMP,URL         DEFAULT USES HL
      002216L 00110111 00000001
```

TSTIT SW64K
BRA POPSTKX,TZ
LDPR STW,SSTKPE

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255.  002217L 11001111 10010001          BRA     POPSTK
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                        . MEMORY PARITY FAULT CODE!  VERY WEIRD!
258.                    *
259.  002220L 01011001 11111011   MEMPF2   BPGX    $                IF FROM WRONG EVEN/ODD PAGE PAIR
260.  002221L                     MEMPF$:
261.                    . *********
262.                    . P.C. UPPED TO NEXT INST. WHEN GET MEMPF, WILL ALWAYS ASSUME IT CORRECT
263.                    . HOPING TO POINT TO THE NEXT INSTRUCTION.
264.                    . *********
265.
266.  002221L 00110001 00110111            LDRP    TEMP1,STEK,CC    GET AND SAVE STATUS WORD
      002222L 01101111 10110001
267.                    .                 STB     CMPF             CLEAR THE FAULT (NOT NECESSARY)
268.                    .                                          (THE NEXT READ/WRITE DOES IT)
269.  002223L 00110001 11011100            DOPIP   MODW,ND,-1-SWUSER,PSWI ENABLE MEMORY ACCESSING
      002224L 01010101 11111011
      002225L 00110111 00000100
270.  002226L 01010001 00001111            LDPI    LIMP,IMPL        USING HIDDEN REGS AND PSHSTK
      002227L 00110111 00000001
271.  002230L 00110001 10001111            DLDX    MR2IM,DIMP       SAVE THE MAR ON THE STACK
      002231L 00110111 00001001
      002232L 00110001 10101111
272.  002233L 01010101 11000000            DOTI    ,ND,0300
273.  002234L 01000000 10000000            TSTIT   XR,0200          HIGH BIT ON, NEXT BIT OFF?
274.  002235L 11000010 01010111            BRA     MEMNBAS,FZ       NO, IN ANOTHER 16K CHUNK
275.  002236L 01010001 11101111            DLRPI   MAR0,SEBRLS,~~SMR~~  IN BASED AREA, GET BASE REG VALUE
      002237L 00110111 11100000            TSTIP   ,SW64K,PSWI
      002240L 01010001 10101011            BRA     MEMN64K,FZ
      002241L 00110111 11000000            LDPR    STW,SST16E
      002242L 00110111 01000111  MEMN64K -STB     SMR
276.  002243L 00110001 11011111            LDTP    IMPI             SO ADDRESS MATCHES 5500 VALUE
277.  002244L 11000100 01011011            MWAIT   ,MEMPQ           !!! HELP !!!
      002245L 11000111 01010100
278.  002246L 00110010 00110110            DOPP    IMPO,AC,MDR      ADD IN BASING
      002247L 00110111 10001111
279.  002250L 00110111 00001000  MEMNBAS    STB     IIMP             POINT TO LSB TO SAVE
280.  002251L 01010001 01010100            BRC     ~~PSHSTO~~ SYSPSHL  PUSH MAR VALUE ON THE STACK
      002252L 11001111 11010011
281.  002253L 01010001 00000110  MEMPQ     LDTI    SRSYSMF          ASSUME THE WORST, GOT ANOTHER FAULT
282.  002254L 11000100 01010011            MWAIT   ,MEMPX           !!! HELP !!!
      002255L 11000111 01001001
283.  002256L 01110001 11110001            TSTIR   ,STLSP,TEMP1     SP: SECTOR TABLE PARITY FAULT
      002257L 01000101 10000000
284.  002260L 11000010 01000111            BRA     MEMPS,FZ
285.  002261L 01000101 01000000            TSTIT   ,STLW            WV: WRITE VIOLATOIN FAULT
286.  002262L 11000010 01000011            BRA     MEMPW,FZ
287.  002263L 01000101 00000001            TSTIT   ,STLA            AV: ACCESS VIOLATION FAULT
288.  002264L 11000010 01000101            BRA     MEMPA,FZ
289.  002265L 01010001 00010010            LDTI    SRMEMPE          MP: MEMORY PARITY FAULT
290. >002266L 01011001 11111111  MEMPX     BRAX    SCROMLI          THESE ERRORS GO TO ROM VECTORS!
     >002267L 11001111 11111111
291.
292.  002270L 01010001 00011011  MEMPS     LDTI    SRSTPE           SECTOR, ROM VECTOR
293.  002271L 11001111 01001001            BRA     MEMPX
```
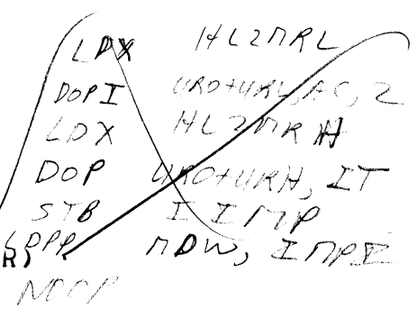

```
. MEMORY PARITY FAULT CODE!  VERY WEIRD!

 294.
 295.  002272L 01010001 00011000   MEMPA   LDTI    SVAVIOL          ACCESS, RAM VECTOR
 296.  002273L 11001111 01000010           BRA     MEMPR
 297.
 298.  002274L 01010001 00010010   MEMPW   LDTI    SVWVIOL          WRITE, RAM VECTOR
 299. >002275L 01011001 11111111   MEMPR   BRAX    SCRAMI           AND THESE GO TO RAM VECTORS
      >002276L 11001111 11111111
```

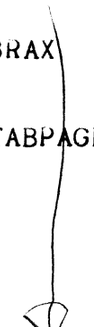
. STACK LOAD, STORE AND MOVE (MOVE WITH SYSTEM SAVE AREA)

```
302.
303.  002277L                          *
304.                                   STKS:
305.                                   .        (    065)  STKS          SAVE STACK CONTENTS
306.                                   . -0.30 + C * 8.80                 (HL+1 | HL) <- (SP+1 | SP)
307.                                   .                                  HL <- HL + 2; SP <- SP + 2
308.                                   .                                  C <- C - 1; UNTIL = 0 (16)
309.
310.                                   .        (111 065)  STKL          LOAD STACK CONTENTS
311.                                   . -0.30 + C * 9.20                 (SP-1 | SP-2) <- (HL-1 | HL)
312.                                   .                                  HL <- HL - 2; SP <- SP - 2
313.                                   .                                  C <- C - 1; UNTIL = 0 (16)
314.
315.                                   . 2.80   (022 065)  SYSM           TO XA, MOVE SYSTEM SAVE AREA
316.                                   . 2.80   (062 065)  SYSM           TO BC
317.                                   . 2.80   (174 065)  SYSM           TO DE  (SWAP WITH REG PAIR)
318.                                   . 2.80   (176 065)  SYSM           TO HL
319.                                   .                                  SP-1 | SP <-> RP
320.  002277L 11001000 00100111             BRA     STKL,F@,IZ           LOAD THE STACK (OR MOVE IT)
321.  002300L 01010001 00001111             LDPI    LIMP,IMPL            POINT TO HIDDEN REGISTERS
      002301L 00110111 00000001
322.  002302L 01010001 00111011             BRC     POPSTO               GET THE TOP STACK ENTRY (M. POINTER)
      002303L 11001111 10010010
323.  002304L 00110001 11100101             DLRX    HL2MR,,IIMP          POINT TO MEMORY AND CORRECT IMP
      002305L 00110001 11000110
      002306L 00110111 00001000
324.  002307L 00110001 11011111             LDPP    MDW,IMPI             STORE THE LSB
      002310L 00110111 00101001
325.  002311L 00110001 11010110             DADDP   URO+UR,URI+UR,2      UPDATE THE HL POINTER (POPST DOES CC)
      002312L 01010010 00000010
      002313L 00110111 10000110
      002314L 00110001 11010101
      002315L 00110110 10000101
326.  002316L 11000100 00110001             MWAIT   ,MEMPF$
      002317L 11000111 01101110
327.  002320L 00110111 00001100             STB     IMAR,DIMP            STORE THE MSB
      002321L 00110111 00001001
328.  002322L 00110001 11011111             LDPP    MDW,IMPI
      002323L 00110111 00101001
329.  002324L 01010001 00000000             LDPI    LIMP,0               RESET IMP FOR STKS OP-CODE
      002325L 00110111 00000001
330.  002326L 01011001 11111001             BRAX    RIN16                DO REPEATED INSTRUCTION
      002327L 11001111 01111101
```



```
                        . STACK LOAD, STORE AND MOVE (MOVE WITH SYSTEM SAVE AREA)

331.                    *
332.  002330L           STKL
333.                    .       (111 065)  STKL          LOAD STACK CONTENTS
334.                    . -0.30 + C * 9.20               (SP-1 | SP-2) <- (HL-1 | HL)
335.                    .                                HL <- HL - 2; SP <- SP - 2
336.                    .                                C <- C - 1; UNTIL = 0 (16)
337.
338.                    . 2.80   (062 065)  SYSM          TO BC,  MOVE SYSTEM SAVE AREA
339.                    . 2.80   (174 065)  SYSM          TO DE
340.                    . 2.80   (176 065)  SYSM          TO HL   (SWAP WITH REGISTER PAIR)
341.                    . 2.80   (022 065)  SYSM          TO XA
342.                    .                                SP-1 | SP <-> RP
343.
344.  002330L 11011010 11111111          BRA     SYSM,F@,IO          DO SYS AREA SWAP!
345.  002331L 00110001 11100101          DLRX    HL2MR,,SMR
      002332L 00110001 11000110
      002333L 00110111 01000111
346.  002334L 01010001 00001110          LDPI    LIMP,IMPH           POINT TO HIDDEN SAVE MSB
      002335L 00110111 00000001
347.  002336L 00010111 10110010          CCLR
348.  002337L 00110001 11010110          DOPIP   URO+URL,SB,2,URI+URL DECREMENT L
      002340L 01010100 00000010
      002341L 00110111 10000110
349.  002342L 11000100 00011101          MWAIT   ,STKLPF             IF ERROR BE SURE TO DECR. H
      002343L 11000111 00010110
350.  002344L 00110111 00001101          STB     DMAR
351.  002345L 00110001 00110110          LDPP    IMPO,MDR            GET MSB AND POINT FOR LSB
      002346L 00110111 10001111
352.  002347L 00110111 01000111          STB     SMR,IIMP
      002350L 00110111 00001000
353.  002351L 00110001 11010101  STKLPF  DOPIP   URO+URH,SB,0,URI+URH DECREMENT H
      002352L 01010100 00000000
      002353L 00110111 10000101
354.  002354L 11000100 00010011          MWAIT   ,MEMPFS
      002355L 11000111 01101110
355.  002356L 00110001 00110110          LDPP    IMPO,MDR            GET LSB DATA
      002357L 00110111 10001111
356.  002360L 01010001 00001101          BRC     PSHSTO              PUT IT ON THE STACK
      002361L 11001111 11010011
357.  002362L 01010001 00000001          LDPI    LIMP,1              SET IMPLICIT ODD!
      002363L 00110111 00000001
358.  002364L 11000100 00001011          MWAIT   ,MEMPFS
      002365L 11000111 01101110
359.  002366L 00110001 11011100          LDPP    MODW,PSWI           RESTORE STATE HERE BEFORE REPEAT LOOP
      002367L 00110111 00000100
360.  002370L 01011001 11111001          BRAX    RIN16               AND REPEAT IF NEEDED
      002371L 11001111 01111101
```

```
361.
362.  002372L
363. >002372L 01011001 11111111
     >002373L 11001111 11111111
364.
365.  002374L 11111111 11111111
      002375L 11111111 11111111
      002376L 11111111 11111111
      002377L 11111111 11111111

                *
SYSRET0:                                OFF PAGE JUMP FOR SYSRETURN CODE
                BRAX    SYSRET1
                .
                TABPAGE PRODL
```



```
TSTIT   ,SW64K
BRA     R1N16,TZ
LDPR    STW,4STKPE
BRA     R1N16
```

. STACK LOAD, STORE AND MOVE (MOVE WITH SYSTEM SAVE AREA)

```
366.                                    +
367.  002400L                          SYSM
368.                                   . 2.80   (022 065)  SYSM  XA          MOVE SYSTEM AREA
369.                                   . 2.80   (062 065)  SYSM  BC
370.                                   . 2.80   (174 065)  SYSM  DE          (SWAP POINTER WITH REGISTER PAIR)
371.                                   . 2.80   (176 065)  SYSM  HL
372.                                   .                                    SP-1 | SP <-> RP
373.
374.                                   .                                      <8-MSB> <X|PPPPP0>
375.                                   .                                      WHERE:   8-MSB IS CORRECT MSB
376.                                   .                                               X     IS 128 BYTE BOUNDARY
377.                                   .                                               PPPPP IS STACK POINTER
378.                                   .                                               1     IS FORCED ONE AND
379.                                   .                                               0     IS FORCED ZERO FOR
380.                                   .                                                       CORRECT OPERATION
381.
382.  002400L 00110001 11011100                TSTIP    ,SWUSER,PSWI      NOT ALLOWED IF IN USER MODE
      002401L 01000101 00000100
383.  002402L 11010010 11100000                BRA      IVIOL2,FZ
384.  002403L 00110001 11011111                DOTIP    ,ND,-2,IMPI       LOW BIT MUST BE OFF
      002404L 01010101 11111110
385.  002405L 01010011 01000000                DOPI     MAROL,OR,0100     BIT 6 MUST BE ON
      002406L 00110111 11000000
386.  002407L 00110111 00001001                STB      DIMP
387.  002410L 00110001 11101111                LDX      IM2MRH            SAVE NEW REG PAIR
388.  002411L 00110001 11011010                LDPP     IMPO,SPIH,IIMP    MOVE STACK TO REG PAIR
      002412L 00110111 10001111
      002413L 00110111 00001000
389.  002414L 00110001 11011011                LDPP     IMPO,SPIL
      002415L 00110111 10001111
390.  002416L 00110001 10001011                DLDX     MR2SP             MOVE SAVED NEW STACK POINTER
      002417L 00110001 10101010
391.  002420L 11001111 11111010                BRA      FETCH
```

```
394.                                    *
395.  002421L                          SIR0:
396.                                   . 2.10   (    022)  XA              SELECT XA REGISTER PAIR
397.
398.  002421L 00110111 01000111                   STB      SMR             START TO GET THE OP-CODE
399.  002422L 11011000 11100000                   BRA      IVIOL2,F@,IZ    MULTIPLE IMPLICITS IN A ROW IS ERROR
400.  002423L 01010001 00010000                   LDPI     LIMP,IMP8
      002424L 00110111 00000001
401.  002425L 00110001 10001001                   DLDX     MR2PC
      002426L 00110001 10101000
402.  002427L 11001111 11110000                   BRA      FETLIMP
403.                                    *
404.  002430L                          SIRX:
405.                                   . 2.10   (    111)  B               SELECT B OR IMP ODD
406.                                   .        (    062)  C               SELECT C OR BC OR IMP EVEN
407.                                   .        (    113)  D               SELECT D
408.                                   .        (    174)  E               SELECT E OR DE
409.                                   .        (    115)  H               SELECT H
410.                                   .        (    176)  L               SELECT L OR HL
411.                                   .        (    117)  X               SELECT X
412.
413.  002430L 00110111 01000111                   STB      SMR             START TO GET REAL OP-CODE
414.  002431L 11011000 11100000                   BRA      IVIOL2,F@,IZ    MULTIPLE IMPLICITS IN A ROW IS ERROR
415.  002432L 01010101 00000111                   DOPI     LIMP,ND,7
      002433L 00110111 00000001
416.  002434L 00110001 10001001                   DLDX     MR2PC
      002435L 00110001 10101000
417.  002436L 11001111 11110000                   BRA      FETLIMP
418.                                    *
419. >002437L 01011001 11111111        IVIOL2   BRAX     IVIOL$
     >002440L 11001111 11111111
```

```
422.                                    *
423.  002441L                          JUMPCC:
424.                                    .          (    1C0)  JCC.LSB.MSB      CONDITIONAL JUMP
425.                                    . 3.30 (0.85 NOT TAKEN)                PC <- NN
426.                                    .          (    100)  JFC.LSB.MSB      FALSE CARRY
427.                                    .          (    110)  JFZ.LSB.MSB      FALSE ZERO (.NE.)
428.                                    .          (    120)  JFS.LSB.MSB      FALSE SIGN (.GE.)
429.                                    .          (    130)  JFP.LSB.MSB      FALSE PARITY (EVEN)
430.                                    .          (    140)  JTC.LSB.MSB      TRUE CARRY
431.                                    .          (    150)  JTZ.LSB.MSB      TRUE ZERO (.EQ.)
432.                                    .          (    160)  JTS.LSB.MSB      TRUE SIGN (.LT.)
433.                                    .          (    170)  JTP.LSB.MSB      TRUE PARITY (ODD)
434.
435.  002441L 00110001 00110001                    TSTIP    ,STUSCF,STATUS    TEST CC
      002442L 01000101 00000001
436.  002443L 11010010 11011000                    BRA      JUMP,FZ           YES, IT'S MET, DO THE JUMP
437.                                    *
438.  002444L                          NOJ:
439.                                    . 0.50     (    045)  NOJ.LSB.MSB      3 BYTE NO-OP
440.
441.  002444L 00110111 00001100                    STB      IMAR,IMAR         ONLY 2 IMAR'S (THINK ABOUT IT)
      002445L 00110111 00001100
442.  002446L 11001111 11110111                    BRA      FETCHN
443.                                    *
444.  002447L                          JUMP:
445.                                    . 2.85     (    104)  JMP.LSB.MSB      UNCONDITIONAL JUMP
446.                                    .                                      PC <- NN
447.
448.  002447L 00110111 01000111                    STB      SMR               GET THE LSB
449.  002450L 11001110 11111111                    MWAIT    NOOP,MEMPF2
      002451L 11010100 11010110
      002452L 11000111 01101111
450.  002453L 00110111 00001100                    STB      IMAR              GET THE MSB
451.  002454L 00110001 00110110                    LDRP     TEMP1,MDR
      002455L 01101111 11110001
452.  002456L 00110111 01000111                    STB      SMR
453.  002457L 11001110 11111111                    MWAIT    NOOP,MEMPF2
      002460L 11010100 11001111
      002461L 11000111 01101111
454.  002462L 00110001 00110110                    LDPP     MAROH,MDR         GOT THE MSB
      002463L 00110111 11100000
455.  002464L 01110001 11110001                    LDPR     MAROL,TEMP1       AND SAVED LSB
      002465L 00110111 11000000
456.  002466L 11001111 11110111                    BRA      FETCHN            GO TO IT!
```

```
                                    SDGBF        BRA  BFLR, F@, IZ
                                    *
002467L                             LD6:
                                    . 1.95    (    0D6)  LD.VVV           LOAD REG WITH IMMEDIATE VALUE
                                    .                                     D <- N
                                    .         (    006)  LA.VVV           LOAD A-REG
                                    .         (    016)  LB.VVV
                                    .         (    026)  LC.VVV
                                    .         (    036)  LD.VVV
                                    .         (    046)  LE.VVV
                                    .         (    056)  LH.VVV
                                    .         (    066)  LL.VVV
                                    .         (    076)  LX.VVV             LOAD X-REG WITH IMMEDIATE VALUE

002467L 00110111 01000111                     STB      SMR                READ THE DATA BYTE
002470L 11001110 11111111                     MWAIT    NOOP,MEMPF2
002471L 11010100 11000110
002472L 11000111 01101111
002473L 00110111 00001100                     STB      IMAR
002474L 00110001 00110110                     LDPP     I350,MDR,SMR       GET THE DATA
002475L 00110111 10001101
002476L 00110111 01000111
002477L 00110001 10001001                     DLDX     MR2PC              (MAKE THE COMMONEST INSTRUCTION FASTER)
002500L 00110001 10101000
002501L 11001111 11110100  BFLR               BRA      FETCHL             AND GO TO THE NEXT INSTRUCTION
                                    *    BRAX      BFLROP
002502L                             LD7:
                                    . 1.75    (    3D7)  LRM              LOAD BYTE FROM MEMORY INTO REG
                                    .                                     D <- (HL)
                                    . 2.10    (062 3D7)  LRM              D <- (BC)
                                    . 2.10    (174 3D7)  LRM              D <- (DE)
                                    . 2.10    (022 3D7)  LRM              D <- (XA)

002502L 11011000 10111000                     BRA      LD7I,F@,IZ         SPECIFIED IMP?
002503L 00110001 11100101                     DLRX     HL2MR,,SMR         NO, THEN USE HL AS ADDRESS
002504L 00110001 11000110
002505L 00110111 01000111
002506L 11011111 10110011                     BRA      LD7CMN
002507L 00110001 11001111           LD7I      DLDX     IM2MR,DIMP         POINT AND START MEMORY READ
002510L 00110111 00001001
002511L 00110001 11101111
002512L 11001110 11111111                     DELAY    1
002513L 00110111 01000111                     STB      SMR
002514L 11001110 11111111           LD7CMN    MWAIT    NOOP,$+1           PUT IN STANDARD 200 NS DELAY FROM READY
002515L 11010100 10110010
002516L 11010100 10110000
002517L 00110001 00110110                     LDPP     I350,MDR           GET THE DATA FIRST, THEN
002520L 00110111 10001101
002521L 11000110 11111010                     BRA      FETCH,F@,MP        NO FAULT AFTER READ, THEN DONE
002522L 11001111 01101111                     BRA      MEMPF2             ELSE, GO TO FAULT ROUTINE
```

```
496.                                    *
497.  002523L                          L7S:
498.                                    . 1.30   (   37S)  LMR          STORE A BYTE IN MEMORY
499.                                    .                               (HL) <- S
500.                                    . 1.55   (062 37S)  LMR          USE REG PAIR BC
501.                                    . 1.55   (174 37S)  LMR          USE REG PAIR DE
502.                                    . 1.55   (022 37S)  LMR          USE REG PAIR XA
503.                                    .                               (RP) <- S
504.
505.  002523L 11011000 10100110                BRA     L7SI,F@,IZ      ALMOST EXACTLY LIKE LD7
506.  002524L 00110001 11000110                DLDX    HL2MR
      002525L 00110001 11100101
507.  002526L 00110001 11011110                LDPP    MDW,I02I
      002527L 00110111 00101001
508.  002530L 11001111 11111100                BRA     FETCHW
509.  002531L 00110001 11001111    L7SI        DLDX    IM2MR,DIMP
      002532L 00110111 00001001
      002533L 00110001 11101111
510.  002534L 00110001 11011110                LDPP    MDW,I02I        WRITE REGISTER IN MEMORY
      002535L 00110111 00101001
511.  002536L 11001111 11111100                BRA     FETCHW
512.                                    *
513.  002537L                          LDS:
514.                                    . 0.50   (    3DS)  LRR          LOAD SOURCE REGISTER INTO ANOTHER REG
515.                                    .                               D <- S
516.
517.  002537L 00110001 11011110                LDPP    I350,I02I       SAVE SOURCE REGISTER IN DESTINATION
      002540L 00110111 10001101
518.  002541L 11001111 11110111                BRA     FETCHN          AND DONE!
```

LDSOP2: BRA DOP2,F@,IZ
LDPP I350,I02I
BRA FETCHN
DOP2: LDRT TEMP1
BRAX DMBR,T@,IO
BRA DBCI

LDSDOP:
BRA DOØ,F@,IZ
LDS: LDPP I350,I02I
BRA FETCHN
DOP LDRT TEMP1
BRAX DBCM,F@,IØ
BRA DBCP

```
521.                                    *
522.  002542L                           AP4:
523.                                    . 2.75   (    0P4).  OP.VVV      ALUOP ON IMMEDIATE VALUE
524.                                    .        (IMP 0P4)  OP.VVV      ALUOP IS OTHER THAN TO A-REG.
525.                                    . +.45 IF 'AC' OR 'SB'          R <- R OP N
526.                                    .        (    004)  AD.VVV      ADD IMMEDIATE VALUE TO A-REG
527.                                    .        (IMP 004)  AD.VVV      ADD IMMEDIATE VALUE TO IMP-REG
528.                                    .        (    014)  AC.VVV      ADD WITH CARRY IMM. TO A-REG
529.                                    .        (IMP 014)  AC.VVV      ADD WITH CARRY IMM. TO IMP-REG
530.                                    .        (    024)  SU.VVV      SUB IMMEDIATE VALUE FROM A-REG
531.                                    .        (IMP 024)  SU.VVV      SUB IMMEDIATE VALUE FROM IMP-REG
532.                                    .        (    034)  SB.VVV      SUB WITH CARRY IMM. FROM A-REG
533.                                    .        (IMP 034)  SB.VVV      SUB WITH CARRY IMM. FROM IMP-REG
534.                                    .        (    044)  ND.VVV      AND IMMEDIATE VALUE TO A-REG
535.                                    .        (IMP 044)  ND.VVV      AND IMMEDIATE VALUE TO IMP-REG
536.                                    .        (    054)  XR.VVV      XOR IMMEDIATE VALUE TO A-REG
537.                                    .        (IMP 054)  XR.VVV      XOR IMMEDIATE VALUE TO IMP-REG
538.                                    .        (    064)  OR.VVV      IOR IMMEDIATE VALUE TO A-REG
539.                                    .        (IMP 064)  OR.VVV      IOR IMMEDIATE VALUE TO IMP-REG
540.                                    .        (    074)  CP.VVV      SUB IMM. VALUE FROM A-REG TO SET FLAGS
541.                                    .        (IMP 074)  CP.VVV      SUB IMM. VALUE FROM IMP-REG TO SET FLAG
542.
543.  002542L 00110111 01000111                 STB      SMR           GET FOLLOWING IMMEDIATE DATA
544.  002543L 01101111 11110010                 LDRT     TEMP2         SAVE ALU OP-CODE
545.  002544L 11010100 10011011                 MWAIT    ,MEMPF2
      002545L 11000111 01101111
546.  002546L 00110001 00110110                 LDTP     MDR           THE DATA IS IN T
547.  002547L 00110111 00001100                 STB      IMAR
548.  002550L 11011111 10001000                 BRA      ALUOP
549.                                    *
550.  002551L                           AP7:
551.                                    . 3.45   (    2P7).  OPM        ALUOP WITH MEMORY DATA
552.                                    .        (IMP 2P7)  OPM         DEST. OTHER THAN A-REG
553.                                    . +.45 IF 'AC' OR 'SB'          R <- R OP (HL)
554.
555.  002551L 01101111 11110010                 LDRT     TEMP2         SAVE ALU OP-CODE
556.  002552L 00110001 11100101                 DLRX     HL2MR,,SMR    GET THE DATA
      002553L 00110001 11000110
      002554L 00110111 01000111
                                        POPRUN  MWAIT    NOOP,MEMPF2
557.  002555L 11001110 11111111
      002556L 11010100 10010001
      002557L 11000111 01101111
558.  002560L 00110001 11001001                 DLDX     PC2MR,,IMAR   SO ALUOP CAN USE FETCHN RETURN
      002561L 00110001 11101000
      002562L 00110111 00001100
559.  002563L 00110001 00110110                 LDTP     MDR           THE DATA
560.  002564L 11011111 10001000                 BRA      ALUOP         AND GO WORK WITH IT
```

POPR STB SMR

POPRI LDRT TEMP2
MWAIT ,MEMPF
LDX XX2MRH+1RX
LDPP MAROL,MOR,SMR
BRA POPRUN

```
                                . ARITHMETIC LOGICAL UNIT OPERATIONS
561.                            +
562.  002565L                    APS:
563.                            . 1.65   (    2PS)  OPR              ALUOP WITH SOURCE REGISTER
564.                            .        (IMP 2PS)  OPR              DEST. OTHER THAN A-REG
565.                            . +.45 IF 'AC' OR 'SB'               R <- R OP S
566.
567.  002565L 01101111 11110010          LDRT     TEMP2              SAVE ALU OP-CODE
568.  002566L 00110001 11011110          LDTP     I02I               SELECT SOURCE REG.
569.                            .         BRA      ALUOP
570.
571.  002567L                    ALUOP
572.                            . 1.40
573.                            . +.45 IF 'AC' OR 'SB'
574.
575.  002567L 01101111 11110001          LDRT     TEMP1              SAVE SOURCE REG.
576.  002570L 01110001 11110010          LDTR     TEMP2              GET OPCODE
577.  002571L 00010111 10010010          SHIFT    SR,CC              GET ALUOP IN BITS 4-2
578.  002572L 01010101 00011100          DOTI     ,ND,034            SELECT 3 BITS
579.  002573L 01010010 01100101          DORA     LINK,AC,ALUXQT,,CC OFFSET TO THE EXEC TABLE
      002574L 01101111 10110000
580.  002575L 11101111 00000000          BRR      LINK               GO TO CORRECT ROUTINE
581.                            *
582.                            . THE TABLE STARTS HERE AND IS BACKWARDS
583.
584.                            .        (    A7S)  CP                 2'S COMPLEMENT SUBTRACT TO SET FLAGS
585.
586.  002576L 00110001 11011111          DOPRP    LUF,SB,TEMP1,IMPI,CO
      002577L 01110100 00110001
      002600L 00110111 00000110
587.  002601L 11001111 11110111          BRA      FETCHN
588.
589.                            .        (    A6S)  OR                 LOGICAL INCLUSIVE OR
590.
591.  002602L 00110001 11011111          DOPRP    IMPFO,OR,TEMP1,IMPI,CC
      002603L 01110011 10110001
      002604L 00110111 01101111
592.  002605L 11001111 11110111          BRA      FETCHN
593.
594.                            .        (    A5S)  XR                 LOGICAL EXCLUSIVE OR
595.
596.  002606L 00110001 11011111          DOPRP    IMPFO,XR,TEMP1,IMPI,CC
      002607L 01110000 10110001
      002610L 00110111 01101111
597.  002611L 11001111 11110111          BRA      FETCHN
598.
599.                            .        (    A4S)  ND                 LOGICAL AND
600.
601.  002612L 00110001 11011111          DOPRP    IMPFO,ND,TEMP1,IMPI,CC
      002613L 01110101 10110001
      002614L 00110111 01101111
602.  002615L 11001111 11110111          BRA      FETCHN
603.
```

. ARITHMETIC LOGICAL UNIT OPERATIONS

```
604.                                .       (    A3S)  SB              2'S COMPLEMENT SUBTRACT WITH CARRY
605.
606.  002616L 00110001 00110101             LDRP     TEMP2,UCFLG
      002617L 01101111 11110010
607.  002620L 01110010 00110010             DOTR     ,AC,TEMP2,,C0    SET THE CARRY
608.  002621L 11001110 11111111             NOOP
609.
610.                                .       (    A2S)  SU                2'S COMPLEMENT SUBTRACT
611.
612.  002622L 00110001 11011111             DOPRP    IMPFO,SB,TEMP1,IMPI
      002623L 01110100 11110001
      002624L 00110111 01101111
613.  002625L 11001111 11110111             BRA      FETCHN
614.
615.                                .       (    A1S)  AC              2'S COMPLEMENT ADD WITH CARRY
616.
617.  002626L 00110001 00110101             LDRP     TEMP2,UCFLG
      002627L 01101111 11110010
618.  002630L 01110010 00110010             DOTR     ,AC,TEMP2,,C0    SET THE CARRY
619.  002631L 11001110 11111111             NOOP
620.
621.                                .       (    A0S)  AD                2'S COMPLEMENT ADD
622.
623.  002632L 00110001 11011111  ALUXQT     DOPRP    IMPFO,AC,TEMP1,IMPI
      002633L 01110010 11110001
      002634L 00110111 01101111
624.  002635L 11001111 11110111             BRA      FETCHN
```

```
627.                                    *
628.  002636L                          SRVRPT:                                 REPEATED SERVICE REQUESTS
629.
630.  002636L 00110001 11011100                 DQPIP    PSWO,OR,SWRPT,PSWI SET REPEAT FLAG
      002637L 01010011 00100000
      002640L 00110111 10001100
631.  002641L 11010100 01011110                 MWAIT    ,MEMPF2
      002642L 11000111 01101111
632.
633.  002643L                          SRVNXT:
634.
635.                                    . FOLLOWING TIMING ASSUMED OR CORRECTED TILL THIS POINT REACHED
636.                                    .    (NOT INCLUDING OFF-PAGE ROUTINES)
637.
638.  002643L 00110001 00110000                 TSTTP    FI,SRVREQ          RELOAD SERVICE REQUEST FLAGS
639.  002644L 11010011 01010100                 BRA      SRVRTW,TZ          (SPEEDUP, REALLY NO MORE INTERRUPTS)
640.                                    *
641.  002645L                          SRVDO:                                  SERVICE LOOP - PRIORITY SEQUENCE
642.                                    . ********************************************************************
643.                                    . NOTICE::   ALL SERVICE ROUTINES THAT USE THE MAR MUST FIRST HAVE A
644.                                    .            MWAIT ,$+1  SO THAT THE MEMORY BUS IS NOT OVERRUN.
645.                                    .            ALSO, THE MODE-WORD SWUSER MODE BIT MAY NEED TO BE TURNED OFF
646.                                    .            TO ALLOW ACCESS TO PROTECTED MEMORY
647.                                    . ********************************************************************
648.                                    . NOTE:  P.C. POINTS TO START OF INSTRUCTION BEING EXECUTED (REPEATED)
649.                                    .        OR TO INST. THAT WAS TO BE EXECUTED (FETCH)
650.                                    .        NOT INCLUDING THE IMP-SPEC.
651.                                    . ********************************************************************
652.
653.  002645L 01000101 00010000                 TSTIT    ,SCDSPNL            0.50
654.  002646L 11010010 01001010                 BRA      DLDO,FZ             DISPLAY-KEYBOARD SERVICE
655.  002647L 01000101 00100000                 TSTIT    ,SCONMS             1.80 (SCDON); 1.90 (SCLST)
656.  002650L 11010010 01001000                 BRA      OMDO,FZ             ONE MILLI-SECOND INT
657.  002651L 01000101 01000000                 TSTIT    ,SCHUMS             1.15 (DO NOTHING)
658.  002652L 11010010 00101110                 BRA      HUMDO,FZ            HUNDRED MICRO-SEC INT
659.                                    *
660.  002653L                          SRVRTW:
661.                                    .                                     2.85 (RE-FETCH); 1.25 (RPT'D)
662.  002653L 11010100 01010100                 MWAIT    ,MEMPF2             FOR TRAILING MDW'S
      002654L 11000111 01101111
663.  002655L 00110001 11011100                 LDPP     MODW,PSWI           RESTORE CORRECT MODE (IF CHANGED)
      002656L 00110111 00000100
664.  002657L 01000101 00100000                 TSTIT    ,SWRPT              REPEATED INSTRUCTION?
665.  002660L 11000010 11101011                 BRA      SRVID,FZ            YES, DO IT ONLY
666.                                    .                                     WARNING! SOME REPEATED CODE IN FUTURE
667.                                    .                                     MAY NEED MAR TO MATCH THE PC
668.  002661L 00110001 11101000                 DLRX     PC2MR,,SMR          NO, CODE AS AT FETCH WITHOUT SERVICE
      002662L 00110001 11001001
      002663L 00110111 01000111
669.  002664L 11001111 11110000                 BRA      SRVEND              GO TO FETCH-EXECUTE
```

```
670.                                    *
671. >002665L 01011001 11111111        DLDO    BRAX    DL$DO           DISPLAY - KEYBOARD
     >002666L 11001111 11111111
672.                                    *
673.  002667L                           OMDO                            ONE MILLISECOND INTERRUPT CONTROL
674.                                    . 1.30 (TO SCDON), 1.40 (TO SCLST)
675.                                    . SHOULD BE LAST INTERRUPT IN CHAIN BECAUSE DOESN'T RETURN AS OTHERS DO
676.                                    . THROUGH SRVRET (GOES OFF ON ITS OWN)
677.  002667L 00110111 00001010                 STB     COMF            CLEAR FLAG
678.  002670L 01010001 00100100        OMDOIT  DLDRI   TEMP,SVONEMS    LOAD INTERRUPT VECTOR ADDRESS
      002671L 01101111 11110010
      002672L 01010001 11101111
      002673L 01101111 11110001
679.                                    .                               ($+1 OR SRV. RTN. FAULT GENERATES MEMPF)
680.  002674L 11010100 01000011                MWAIT   ,MEMPF2         WAIT FOR UNUSED INST. FETCH TO COMPLETE
      002675L 11000111 01101111
681. >002676L 01011001 11111111                BPGX    SCDON
682.  002677L 00110001 11011100                TSTIP   ,SWRPT,PSWI     WAS REPEATED INSTRUCTION?
      002700L 01000101 00100000
683. >002701L 11000011 11111111                BRA     SCDON,TZ        NO, THE P.C. CORRECT (IMP - UNKNOWN)
684. >002702L 11001111 11111111                BRA     SCLST           YES, BACK UP P.C. TO IMP-SPEC.
685.
686.                                    . IF I-FETCH ENTRY PC POINTING TO NEXT INSTRUCTION TO EXECUTE SO CORRECT
687.                                    .    IMP IS ZERO BY WAY FETCH CODE WRITTEN
688.                                    . IF NON-I-FETCH (REPEATED) PC POINTING TO INSTRUCTION BEING REPEATED
689.                                    .    IF IMP ZERO PC IS CORRECT, POINTING TO INST. TO CONTINUE
690.                                    .    IF IMP NON-ZERO MUST BACK UP PC TO RE-DO IMP SPEC CODE WHEN MACRO-RETURNS
691.                                    . COULD SIMPLIFY, IF IMP-NON-ZERO MUST BACKUP BECAUSE IS IMP-SPEC REPEATED
```

OMDO
STB COMF
LDTR SMODINS
BAA OMDOIT,TZ
DORI SMODINS,SB,1
BRA SRVNXT

```
                        . NOISE-MAKER INTERFACE.  BEEPS, CLICKS & MAKES OTHER FUNNY NOISES
694.                    *
695.                    . DEFINE THE CONTROL BITS FOR THE AUDIO CHANNEL
696.                    . TOGGLE B7     0  HIGH OUTPUT (IF NOT DELAYING)
697.                    .               1  LOW OUTPUT (ALWAYS)
698.                    . FCN    B6,5  00  BEEP WITH LONG DELAY (NORMAL)
699.                    .              01  BEEP WITH SHORT DELAY
700.                    .              10  DELAYING
701.                    .              11  CLICKING
702.                    . DONE   B4     0  CONTINUE DOING OPERATION
703.                    .               1  STOP, THE END  (IF B7 IS 1)
704.                    . COUNTER B3,2,1,0 COUNT AT A 60/50HZ RATE (BY DL$DO)
705.
706.                    . NOW, DEFINE THE CONTROL COMMANDS (INITIAL/FINAL VALUES)
707.  000203            BPINIT   EQU     B7+B4-13          STANDARD BEEP ENDS WITH B7+B4
708.  000253            BPSHRT   EQU     B7+B5+B4-5        SHORT LENGTH ENDS WITH B7+B5+B4
709.  000310            DLYLNG   EQU     B7+B6+B4-8        STANDARD DELAY ENDS WITH B7+B6+B4
710.  000316            DLYSRT   EQU     B7+B6+B4-2        SHORT DELAY ENDS WITH B7+B6+B4
711.  000360            CLKINI   EQU     B7+B6+B5+B4-0     NORMAL CLICK ENDS WITH B7+B6+B5+B4
712.
713.  000340            CLKLVL   EQU     0340              LEVEL THE CLICK USES ON THE D/A
714.  000177            BYPLVL   EQU     0177              LEVEL THE BEEP USES ON THE D/A
715.                    *
716.  002703L           BEEP:
717.                    .        (    151)  EX BEEP        START AUDIBLE CHANNEL IF QUIET
718.                    .        (IMP 151)  EX BEEP        START AUDIBLE CHANNEL IF QUIET
719.                    . 1.15 (DO IT), 0.85 (PREVIOUS IN PROGRESS)
720.  002703L 01010001 10000011            LDTI     BPINIT           SETUP FOR BEEP OPERATION
721.  002704L 01101111 11110001  CLICKS     LDRT     TEMP1            SAVE AWAY THE CONTROL BYTE
722.  002705L 00110001 11011100            TSTIP    ,SWUSER,PSWI     IS IT LEGAL TO DO THE INSTRUCTION?
      002706L 01000101 00000100
723.  002707L 11010010 11100000            BRA      IVIOL2,FZ        NO, ERROR IT OUT
724.  002710L 00010001 11001101            TSTRT    FI,ACD           ANY SOUNDS IN PROGRESS
725.  002711L 11000010 11110111            BRA      FETCHN,FZ        YES, SO DO NOTHING
726.  002712L 01110001 11110001            LDRR     ACD,TEMP1        NO, SO INIT TO DO THE NEW SOUND
      002713L 00000111 11111101
727.  002714L 11001111 11110111            BRA      FETCHN
728.  002715L                     CLICK:
729.                    .        (    153)  EX CLICK        START AUDIBLE CHANNEL IF QUIET
730.                    .        (IEV 153)  EX CLICK        START AUDIBLE CHANNEL IF QUIET
731.                    . 1.35 (DO IT), 1.05 (PREVIOUS IN PROGRESS)
732.                    .        (IOD 151)  CLICKR          SPECIAL NOISE IF QUIET
733.                    . 1.55 (DO IT), 1.25 (PREVIOUS IN PROGRESS)
734.  002715L 01010001 11110000            LDTI     CLKINI           ASSUME NORMAL CLICK
735.  002716L 11011010 00111011            BRA      CLICKS,F@,IO     IT WAS!
736.  002717L 01010001 10101011            LDTI     BPSHRT           NO, WAS SPECIAL SHORT BEEP
737.  002720L 11011111 00111011            BRA      CLICKS
```

. NOISE-MAKER INTERFACE. BEEPS, CLICKS & MAKES OTHER FUNNY NOISES

```
738.                                    *
739.  002721L                          HUMDO                                   HUNDRED-MICRO-SECOND INTERRUPT (AUDIO)
740.  002721L 00110111 00001011                STB     CHUF                    CLEAR INTERRUPT
741.  002722L 00010001 10111101                LDTR    ACD,CC                  IF ZERO
742.  002723L 11010011 01011100                BRA     SRVNXT,TZ               THE CHANNEL IS OFF (1.15)
743.                                    .       BRAX    AC$DO                   ELSE ON, SO DO IT
744.                                    *
745.  002724L                          AC$DO:
746.                                    . 1.05~1.75
747.                                    . THE SPECIAL AUDIO CHANNEL CONTROL IS DONE HERE
748.                                    . OPERATION IS TO ALTERNATE THE TOGGLE (B7).
749.                                    . IF IT BECOMES SET (FC) OUTPUT LOW VALUE.. IF IT BECOMES CLEAR (TC)
750.                                    . THEN OUTPUT HIGH VALUE IF BEEPING OR CLICKING, DELAY IS A LOW VALUE.
751.                                    . TEST FOR COMPLETION (FC & B4 SET) AND WHEN DONE THE TIMING, SEE IF MORE
752.                                    . TO DO (THE DELAY). IF DELAY ALREADY DONE, THEN END. ELSE, LOAD UP THE
753.                                    . DELAY CONTROL BYTE TO DO IT.
754.                                    . NOTE: LOW ORDER BIT COUNTING IS DONE BY DL$DO ON EVERY BOTLINE (50 / 60 HZ)
755.
756.  002724L 01010010 10000000                DOTI    ,AC,B7                  TOGGLE THE TOGGLE BIT
757.  002725L 11010001 00011010                BRA     ACSIG,TC                WAS 1 (TO 0), DO RISING EDGE BEEP & CLICK
758.  002726L 01000101 00010000                TSTIT   ,B4                             DO FALLING EDGE (OR LOW LEVEL)
759.  002727L 11010011 00011110                BRA     ACLOUT,TZ               WAS 0 (TO 1), NOT DONE, LOW OUTPUT
760.  002730L 01000101 01000000                TSTIT   ,B6                     FINISHED BEEPING?
761.  002731L 11010010 00011111                BRA     ACEND,FZ                NO, FINISHED CLICK OR DELAY FOR GOOD
762.  002732L 01000101 00100000                TSTIT   ,B5
763.  002733L 11010010 00100001                BRA     ACSHRT,FZ
764.  002734L 01010001 11001000                LDTI    DLYLNG                  FINISHED LONG BEEP, DO LONG DELAY
765.  002735L 11011111 00011110                BRA     ACLOUT
766.  002736L 01010001 11001110       ACSHRT   LDTI    DLYSRT                  FINISHED SHORT BEEP, DO SHORT DELAY
767.  002737L 11011111 00011110                BRA     ACLOUT
768.
769.  002740L 01010001 00000000       ACEND    TCLR                            FINISHED ALL OPERATIONS (ALLOW NEXT)
770.  002741L 00000111 11111101       ACLOUT   LDRT    ACD                     SAVE THE NEW CONTROL BYTE
771.  002742L 01010001 00000000                LDPI    LSPKR,0                 OUTPUT LOW TO THE SPEAKER
      002743L 00110111 00101010
772.  002744L 11011111 01011100                BRA     SRVNXT
773.
774.  002745L 01000101 01000000       ACSIG    TSTIT   ,B6                     ARE WE BEEPING?
775.  002746L 11010011 00010010                BRA     ACHOUT,TZ               YES, PUT OUT ITS LEVEL
776.  002747L 01000101 00100000                TSTIT   ,B5                     ARE WE CLICKING?
777.  002750L 11010011 00011110                BRA     ACLOUT,TZ               NO, DELAY OUTPUTS LOW LEVEL
778.  002751L 00000111 11111101                LDRT    ACD                     SAVE THE NEW CONTROL BYTE
779.  002752L 01010001 11100000                LDPI    LSPKR,CLKLVL            OUTPUT CLICK LEVEL
      002753L 00110111 00101010
780.  002754L 11011111 01011100                BRA     SRVNXT
781.
782.  002755L 00000111 11111101       ACHOUT   LDRT    ACD                     SAVE THE NEW CONTROL BYTE
783.  002756L 01010001 01111111                LDPI    LSPKR,BYPLVL            OUTPUT BEEP LEVEL
      002757L 00110111 00101010
784.  002760L 11011111 01011100                BRA     SRVNXT
```

```
 785.
 786.  002761L 11111111 11111111          *
        002762L 11111111 11111111
        002763L 11111111 11111111
        002764L 11111111 11111111
        002765L 11111111 11111111
        002766L 11111111 11111111
        002767L 11111111 11111111
        002770L 11111111 11111111
        002771L 11111111 11111111
        002772L 11111111 11111111
        002773L 11111111 11111111
        002774L 11111111 11111111
        002775L 11111111 11111111
        002776L 11111111 11111111
        002777L 11111111 11111111
```

TABPAGE PRODL

```
                        . BLOCK TRANSFER AND CONVERT
789.                    *
790.  003000L           BT:
791.                    .       (    021)  BT                BLOCK TRANSFER
792.                    . -0.30 + N * 5.30 - N * 0.15 / ODDSTEP + 0.10 WHEN TCFZ / STEP - 0.50 IF MATCH
793.                    .                                    (DE) <- T <- A + (HL)
794.                    .                                    DE <- DE + 1; HL <- HL + 1
795.                    .                                    STOP IF T = -B; C <- C - 1; UNTIL = 0
796.
797.                    .       (111 021)  BTR               BLOCK TRANSFER REVERSE
798.                    . -0.30 + N * 5.60 - N * 0.15 / ODDSTEP + 0.10 WHEN TCFZ / STEP - 0.50 IF MATCH
799.                    .                                    (DE) <- T <- A + (HL)
800.                    .                                    DE <- DE - 1; HL <- HL - 1
801.                    .                                    STOP IF T = -B; C <- C - 1; UNTIL = 0
802.
803.                    .       (062 021)  BCV               BLOCK CONVERT
804.                    . -0.30 + N * 6.85 - N * 0.15 / ODDSTEP + 0.10 WHEN TCFZ / STEP - 0.50 IF MATCH
805.                    .                                    (DE) <- T <- A <- (HL + (DE))
806.                    .                                    DE <- DE + 1
807.                    .                                    STOP IF T = -B; C <- C - 1; UNTIL = 0
808.
809.                    .       NOTE:  NONE OF THESE CHANGE THE CONDITION FLAGS
810.
811.  003000L 11001001 11010100          BRA     BTX,T@,IZ        BT (021)
812.  003001L 11001010 11100110          BRA     BTV,F@,IO        BTR (062 021)
813.                    *
814.  003002L 00110001 11100101  BTR      DLRX    HL2MR,,SMR       BTR (111 021)
      003003L 00110001 11000110
      003004L 00110111 01000111
815.  003005L 00110001 11010000          LDRP    TEMP1,URI+URA    LOAD UP THE A-REG OFFSET
      003006L 01101111 11110001
816.  003007L 11000100 11111000          MWAIT   ,MEMPF3
      003010L 11010111 00010100
817.  003011L 00110111 00001101          STB     DMAR
818.  003012L 00110001 10000110          DLDX    MR2HL            DECREMENT HL FOR BTR
      003013L 00110001 10100101
819.  003014L 00110001 11100011          DLRX    DE2MR
      003015L 00110001 11000100
820.  003016L 00110001 00110110          DOPRP   MDW,AC,TEMP1,MDR,C0 GET RESULTANT DATA
      003017L 01110010 00110001
      003020L 00110111 00101001
821.  003021L 01101111 10110001          LDRT    TEMP1,,CC        STORE DATA IN (DE)
822.  003022L 00110001 10010000          DDECP   URO+UDE,MAR1     BACKUP DE FOR BTR
      003023L 01010100 00000001
      003024L 00110111 10000100
      003025L 00110001 10110000
      003026L 01010100 00000000
      003027L 00110111 10000011
823.  003030L 11001111 10111111          BRA     BTEND
```

```
824.                                    *
825.  003031L 00110001 11100011   BTV     DLRX    DE2MR,,SMR      BCV (062 021)
      003032L 00110001 11000100
      003033L 00110111 01000111
826.  003034L 00010111 10110010           CCLR
827.  003035L 00110001 11010110           LDTP    URI+URL         ADD DATA AT DE TO TABLE POINTER IN HL
828.  003036L 11000100 11100001           MWAIT   ,MEMPF3
      003037L 11010111 00010100
829.  003040L 00110010 00110110           DOPP    MAROL,AC,MDR    A <- MAR <- L + (DE)
      003041L 00110111 11000000
830.  003042L 00110111 10000000           LDPT    URO+URA         STORE IN A SO CAN FIND STOP POINT
831.  003043L 00110001 11010101           LDTP    URI+URH         ADD IN CARRY ALSO
832.  003044L 00110110 11100000           DOP     MAROH,IT
833.  003045L 01010001 00000000           TCLR                    NO A-REG OFFSETS
834.  003046L 00110111 01000111           STB     SMR             INDIRECT THROUGH THIS FOR TABLE ENTRY
835.  003047L 01101111 11110001           LDRT    TEMP1
836.  003050L 11000100 11010111           MWAIT   ,MEMPF3
      003051L 11010111 00010100
837.  003052L 11001111 11001010           BRA     BTCVT
838.                                    *
839.  003053L 00110001 11100101   BTX     DLRX    HL2MR,,SMR      GET DATA AT HL TO BE MOVED
      003054L 00110001 11000110
      003055L 00110111 01000111
840.  003056L 00110001 11010000           LDRP    TEMP1,URI+URA   SAVE THE A-REG OFFSET (ZERO FOR BCV)
      003057L 01101111 11110001
841.  003060L 11000100 11001111           MWAIT   ,MEMPF3
      003061L 11010111 00010100
842.  003062L 00110111 00001100           STB     IMAR
843.  003063L 00110001 10000110           DLDX    MR2HL           INCREMENT FOR FOR BT
      003064L 00110001 10100101
844.  003065L 00110001 11000100   BTCVT   DLDX    DE2MR           POINT TO WHERE TO STORE RESULT
      003066L 00110001 11100011
845.  003067L 00110001 00110110           DOPRP   MDW,AC,TEMP1,MDR,CO STORE DATA IN (DE) AND IN TEMP1
      003070L 01110010 00110001
      003071L 00110111 00101001
846.  003072L 01101111 11110001           LDRT    TEMP1
847.  003073L 00110001 10010000           DADDP   URO+UDE,MARI    INCREMENT DE FOR BT & BCV
      003074L 00010110 01110010
      003075L 00110111 10000100
      003076L 00110001 10110000
      003077L 00110110 10000011
```

```
848.                                    *
849.                                    . BT - 3.25, BTR - 3.55, BCV - 4.80  (TO HERE)
850.
851.  003100L 00110001 11010001   BTEND     TSTRP   AC,TEMP1,URI+URB,C0 AT THE ENDPOINT?
      003101L 01110010 00000001
852.  003102L 11000000 10111010             BRA     RIN256,FC        NO, WANT CARRY TRUE & ZERO TRUE
853.  003103L 11000011 01110111             BRA     RIND,TZ          YES, END NOW!
854.                                    .    BRA     RIN256           NO!
855.                                    .                             NO, REPEAT 256 TIMES (OR LESS)
856.  003104L 00010111 10110010             CCLR                     ONLY CARRY SET RIN256 CASE
```

. REPEATED INSTRUCTIONS, REPEAT CONTROL SECTION

```
859.                                    *
860.  003105L                          RIN256:
861.                                    . ODD - 1.45, RPT - 1.60, SRV - 1.35, END - 1.30
862.
863.                                    .       WARNING, CARRY MUST BE CLEAR ON ENTRY
864.                                    .       BLOCK REPEATED INSTRUCTIONS (THOSE THAT COUNT C THROUGH 256 MAX STEPS
865.                                    .       DO NOT CHANGE FLAGS)
866.
867.  003105L 00110001 11010010                  DOPIP   URO+URC,SB,1,URI+URC IF ZERO, FINISHED
      003106L 01010100 00000001
      003107L 00110111 10000010
868.  003110L 11000011 01110111                   BRA     RIND,TZ
869.  003111L 01000101 00000001                   TSTIT   ,1              DO THEM IN PAIRS SO CAN'T INTERRUPT
870.  003112L 11000010 10110010                   BRA     RINDO,FZ        DURING DOUBLE BYTE MOVE
871.                                    .                               !CAN USE BT IN DISPLAY POINTER MOVES!
872.                                    *
873.  003113L                          RINST:
874.                                    . SRV - 0.65, RPT - 0.90
875.
876.                                    .       LOOP THROUGH REPEATED INSTRUCTIONS, SET THE REPEAT MODE AND DO
877.                                    .       SERVICE REQUEST IF NEEDED ELSE RE-EXECUTE THE INSTRUCTION.
878.
879.  003113L 00110001 00110000                   TSTPT   FI,SRVREQ       DO SERVICE IF NEEDED
880.  003114L 11000010 10101110                   BRA     RINRPT,FZ
881.  003115L 11000100 10110010          RINDO    MWAIT   ,MEMPF3
      003116L 11010111 00010100
882.  003117L 00111001 00110100                   BRPX    IDCOD           GO DO OPCODE AGAIN
      003120L 10101111 00110011
883.
884.  003121L 01011001 11111010          RINRPT   BRAX    SRVRPT
      003122L 11011111 01100001
```

```
                                . BLOCK COMPARE

                                *
                                BCP:
                                .         (    041)  BCP              BLOCK COMPARE
                                . -0.30 + N * 5.25 - 0.15 * N / ODDSTEP - 0.5 IF MATCH
                                .                                     (HL) - (DE); HL <- HL + 1; DE <- DE + 1
                                .                                     STOP IF TZ; C <- C - 1; CONTINUE UNTIL = 0
                                .
                                .         (111 041)  DFAC             DECIMAL FIELD ADD
                                . -0.30 + C * 7.45                    (DE) <- B .OR. (DE) .DAD. (HL) + CRY
                                .                                     DE <- DE - 1; HL <- HL - 1
                                .                                     C <- C - 1; UNTIL = 0 (16)
                                .
                                .         (062 041)  DFSB             DECIMAL FIELD SUBTRACT
                                . -0.30 + C * 7.65                    (DE) <- B .OR. (DE) .DSB. (HL) - CRY
                                .                                     DE <- DE - 1; HL <- HL - 1
                                .                                     C <- C - 1; UNTIL = 0 (16)
003123L 11001000 10010000               BRA     DFOP,F@,IZ          GO TO DECIMAL STUFF
003124L 00110001 11100011               DLRX    DE2MR,,SMR
003125L 00110001 11000100
003126L 00110111 01000111
003127L 00110001 10010000               DADDP   URO+UDE,MARI        GET DATA AND UPDATE DE
003130L 00010110 01110010
003131L 00110111 10000100
003132L 00110001 10110000
003133L 00110110 10000011
003134L 11000100 10100011               MWAIT   ,MEMPF3
003135L 11010111 00010100
003136L 00110001 00110110               LDRP    TEMP1,MDR
003137L 01101111 11110001
003140L 00110001 11100101               DLRX    HL2MR,,SMR          GET DATA AND UPDATE HL
003141L 00110001 11000110
003142L 00110111 01000111
003143L 00110001 10010000               DADDP   URO+UR,MARI
003144L 00010110 01110010
003145L 00110111 10000110
003146L 00110001 10110000
003147L 00110110 10000101
003150L 01110001 10110001               LDTR    TEMP1,CC            GET DE DATA
003151L 11000100 10010110               MWAIT   ,MEMPF3
003152L 11010111 00010100
003153L 00110100 00110110               DOPP    LUF,SB,MDR          SUBTRACT HL DATA AND SET COMPARE FLAGS
003154L 00110111 00000110
003155L 11000011 10111010               BRA     RIN256,TZ           CONTINUE IF A MATCH (CARRY ZERO TOO!)
003156L 11001111 01110111               BRA     RIND                END IF DATA DIFFERS
```

. DECIMAL FIELD OPERATIONS

```
                                                *
003157L                                         DFOP
                                                .       (111 041)  DFAC             DECIMAL FIELD ADD
                                                . -0.30 + C * 7.25                  (DE) <- B .OR. (DE) .DAD. (HL) + CRY
                                                .                                   DE <- DE - 1; HL <- HL - 1
                                                .                                   C <- C - 1; UNTIL = 0 (16)
                                                .
                                                .       (062 041)  DFSB             DECIMAL FIELD SUBTRACT
                                                . -0.30 + C * 7.25 (+ 0.20 PER BORROW)  (DE) <- B .OR. (DE) .DSB. (HL) - CRY
                                                .                                   DE <- DE - 1; HL <- HL - 1
                                                .                                   C <- C - 1; UNTIL = 0 (16)

003157L 01010001 00001111                               LDRI    TEMP2,017           SELECT 4 BITS, NOT ALL OF THEM
003160L 01101111 11110010
003161L 01010001 10000101                               BAL     ,DFADD              (ASSUME THIS)
003162L 11001011 01101011                               BRA     BFOP,T@,IO          WAS ODD THEREFORE WAS DECIMAL ADD
003163L 01010001 10001010                               BAL     ,DFSUB
003164L 11001111 01101011                               BRA     BFOP                WAS EVEN SO IT WAS DECIMAL SUBTRACT

003165L                                         DFSUB
003165L 01110100 11110001                               DOPR    LUF,SB,TEMP1        SET FLAGS ON SUBTRACT
003166L 00110111 00000110
003167L 11000000 01111111                               BRA     DFAEND,FC           NO CARRY, NO PROBLEMS
003170L 01010010 00001001                               DOTI    ,AC,10-1            CARRY, CORRECT THE VALUE (ADDS 10!)
003171L 11001111 01111111                               BRA     DFAEND

003172L                                         DFADD
003172L 01110010 11110001                               DORR    TEMP1,AC,TEMP1      ADD TOGETHER (CARRY FALSE ON RESULT)
003173L 01101111 11110001
003174L 01010010 11110110                               DOPI    LUF,AC,-10          SET FLAGS & CORRECT IF OVERFLOW
003175L 00110111 00000110
003176L 11000001 01111111                               BRA     DFAEND,TC           IF OVERFLOWED, CORRECTED NOW
003177L 01110001 11110001                               LDTR    TEMP1               NO CARRY, GET CORRECT VALUE
003200L 00110011 11010001               DFAEND          DOPP    MDW,OR,URI+URB      SET THE ZONE BITS
003201L 00110111 00101001

                                                .       BRA     RIN16
```

```
951.                                *
952.  003202L                       RIN16:
953.                                . RPT - 1.70, SRV - 1.45, END - 1.40
954.
955.                                .       FIELD REPEATED INSTRUCTIONS ARE THOSE THAT COUNT C THROUGH 16 MAX STEP
956.
957.  003202L 00010111 10110010              CCLR
958.  003203L 00110001 11010010              DOPIP   URO+URC,SB,1,URI+URC COUNT DOWN
      003204L 01010100 00000001
      003205L 00110111 10000010
959.  003206L 01000101 00001111              TSTIT   ,017                AT THE END (BASE 16)?
960.  003207L 11000010 10110100              BRA     RINST,FZ            NOT YET
961.                                *
962.  003210L                       RIND:
963.                                . 0.70                              REPEATED INSTRUCTION END
964.
965.  003210L 00110001 11011100              DOPIP   PSWO,ND,-1-SWRPT,PSWI
      003211L 01010101 11011111
      003212L 00110111 10001100
966.  003213L 01011001 11111011              BRAX    FETCHW
      003214L 11001111 11111100
```

```
 969.                                   *
 970.  003215L                          BFSB:
 971.                                   .       (    031)  BFSB          BINARY FIELD SUBTRACT
 972.                                   . -0.30 + C * 6.90                (DE) <- (DE) - (HL) - CRY
 973.                                   .                                 DE <- DE - 1; HL <- HL - 1
 974.                                   .                                 C <- C - 1; UNTIL = 0 (16)
 975.
 976.  003215L 01010001 11111111                LDRI    TEMP2,0377        SELECT ALL THE BITS
       003216L 01101111 11110010
 977.  003217L 01010001 01001000                BRC     BFOP,,BFSUB
       003220L 11001111 01101011
 978.                                   *
 979.  003221L                          BFAC:
 980.                                   .       (    011)  BFAC          BINARY FIELD ADD
 981.                                   . -0.30 + C * 6.70                (DE) <- (DE) + (HL) + CRY
 982.                                   .                                 DE <- DE - 1; HL <- HL - 1
 983.                                   .                                 C <- C - 1; UNTIL = 0 (16)
 984.
 985.  003221L 01010001 11111111                LDRI    TEMP2,0377        SELECT ALL THE BITS
       003222L 01101111 11110010
 986.  003223L 01010001 01001100                BAL     ,BFADD
 987.                                   *
 988.  003224L                          BFOP
 989.                                   . 4.0                             BINARY FIELD OPERATIONS (ARG GETTER)
 990.
 991.  003224L 01101111 10110000                BAS     LINK,CC
 992.  003225L 00110001 11100101                DLRX    HL2MR,,SMR
       003226L 00110001 11000110
       003227L 00110111 01000111
 993.  003230L 00110001 10010000                DDECP   URO+UR,MARI       GET (HL) DATA AND UPDATE HL
       003231L 01010100 00000001
       003232L 00110111 10000110
       003233L 00110001 10110000
       003234L 01010100 00000000
       003235L 00110111 10000101
 994.  003236L 01110001 11110010                LDTR    TEMP2
 995.  003237L 11000100 01100000                MWAIT   ,MEMPF3
       003240L 11010111 00010100
 996.  003241L 00110101 00110110                DORP    TEMP1,ND,MDR,,CC  PUT IT IN TEMP1
       003242L 01101111 10110001
 997.  003243L 00110001 11100011                DLRX    DE2MR,,SMR
       003244L 00110001 11000100
       003245L 00110111 01000111
 998.  003246L 00110001 10010000                DDECP   URO+UDE,MARI      GET (DE) DATA AND UPDATE DE
       003247L 01010100 00000001
       003250L 00110111 10000100
       003251L 00110001 10110000
       003252L 01010100 00000000
       003253L 00110111 10000011
 999.                                                                     CARRY IGNORED, BITS 2&6 NOT BOTH HIGH
1000.  003254L 00110001 00110101                DOTPP   ,AC,UCFLG,UCFLG   SET THE CARRY
       003255L 00110010 00110101
```

```
1001.  003256L 01110001 11110010          LDTR    TEMP2
1002.  003257L 11000100 01010000          MWAIT   ,MEMPF3
       003260L 11010111 00010100
1003.  003261L 00110101 00110110          DOTP    ,ND,MDR
1004.  003262L 11101111 00000000          BRR     LINK              SELECT ADD & SUBTRACT, BINARY & DECIMAL
1005.                                     *
1006.  003263L 01110010 11110001  BFADD   DOPR    MDW,AC,TEMP1      (DE) <- (DE) + (HL)
       003264L 00110111 00101001
1007.  003265L 00110111 00000110          LDPT    LUF
1008.  003266L 11001111 01111101          BRA     RIN16
1009.
1010.  003267L 01110100 11110001  BFSUB   DOPR    MDW,SB,TEMP1      (DE) <- (DE) - (HL)
       003270L 00110111 00101001
1011.  003271L 00110111 00000110          LDPT    LUF
1012.  003272L 11001111 01111101          BRA     RIN16
```

```
                                . BINARY FIELD SHIFTS LEFT AND RIGHT

1015.                           *
1016.  003273L                  BFS:
1017.                           .       (    075)  BFSL          BINARY FIELD SHIFT LEFT
1018.                           . -0.30 + C * 4.55                (HL) <- (HL) + (HL) + CRY; HL <- HL - 1
1019.                           .                                 C <- C - 1; UNTIL = 0 (16)
1020.
1021.                           .       (111 075)  BFSR           BINARY FIELD SHIFT RIGHT
1022.                           . -0.30 + C * 4.55                (HL) <- SHFTRGHT (HL); HL <- HL + 1
1023.                           .                                 C <- C - 1; UNTIL = 0 (16)
1024.
1025.                           .       NOTE: ONLY CHANGES THE CARRY FLAG
1026.
1027.  003273L 00110001 11100101          DLRX    HL2MR,,SMR      GET DATA TO SHIFT & SELECT R/L ROUTINE
       003274L 00110001 11000110
       003275L 00110111 01000111
1028.  003276L 11001001 00101110          BRA     BFSL,T@,IZ
1029.                           . BFSR
1030.  003277L 00110001 10010000          DADDP   URO+UR,MARI     UPDATE HL
       003300L 00010110 01110010
       003301L 00110111 10000110
       003302L 00110001 10110000
       003303L 00110110 10000101
1031.  003304L 00110001 00110101          LDTP    UCFLG
1032.  003305L 00010111 10100010          SHIFT   SL              PUT THE CARRY IN THE LSB (BIT 0)
1033.  003306L 00010111 10110010          CCLR                    AND INTO THE LINK
1034.  003307L 11000100 00111000          MWAIT   ,MEMPF3
       003310L 11010111 00010100
1035.  003311L 00110001 00110110          LDTP    MDR             GET THE DATA
1036.  003312L 00010111 10010010          SHIFT   SR              DO EXTENDED SHIFT
1037.  003313L 00110111 00101001          LDPT    MDW             OUTPUT SHIFTED DATA
1038.  003314L 00010111 10010010          SHIFT   SR              PUT LINK IN THE MSB
1039.  003315L 01101111 11110001          LDRT    TEMP1
1040.  003316L 01110010 00110001          DOPR    LUCF,AC,TEMP1,,C0 SET THE CARRY FROM THE MSB (LINK)
       003317L 00110111 00000111
1041.  003320L 11001111 01111101          BRA     RIN16
1042.                           *
1043.  003321L 00010111 10110010  BFSL    CCLR                    UPDATE HL
1044.  003322L 00110001 10010000          DDECP   URO+UR,MARI     CARRY IS STOPPED IN BIT 2 OR 6 OR UCFLG
       003323L 01010100 00000001
       003324L 00110111 10000110
       003325L 00110001 10110000
       003326L 01010100 00000000
       003327L 00110111 10000101
1045.  003330L 00110001 00110101          DOTPP   ,AC,UCFLG,UCFLG SET CARRY FROM USER CARRY
       003331L 00110010 00110101
1046.  003332L 11000100 00100101          MWAIT   ,MEMPF3
       003333L 11010111 00010100
1047.  003334L 00110001 00110110          DOPPP   MDW,AC,MDR,MDR  SHIFT LEFT!
       003335L 00110010 00110110
       003336L 00110111 00101001
1048.  003337L 00110111 00000111          LDPT    LUCF            SET CARRY ON RESULT
1049.  003340L 11001111 01111101          BRA     RIN16
```

. SHIFT OPERATIONS

```
1052.
1053.  003341L                          *
                                        SLC:
1054.                                   . 0.95   (    002)  SLC              SHIFT LEFT CIRCULAR
1055.                                   . 0.95   (IMP 002)  SLCR             RN <- R(N-1); CRY <- R0 <- R7
1056.
1057.  003341L 00110001 11011111                  LDRP     TEMP1,IMPI
       003342L 01101111 11110001
1058.  003343L 01110010 00110001                  DOPR     LUCF,AC,TEMP1,,C0 ADD TOGETHER AND SET USER CARRY
       003344L 00110111 00000111
1059.  003345L 00110110 10001111                  DOP      IMP0,IT           PUT CARRY IN THE LSB
1060.  003346L 01011001 11111011                  BRAX     FETCHN            DON'T USE IMPF0, WILL GET BAD CARRY
       003347L 11001111 11110111
1061.                                   *
1062.  003350L                          SRC:
1063.                                   . 1.15   (   012)  SRC              SHIFT RIGHT CIRCULAR
1064.                                   . 1.15   (IMP 012)  SRCR             CRY <- R7 <- R0; R(N-1) <- RN
1065.
1066.  003350L 00110001 11011111                  LDTP     IMPI
1067.  003351L 00010111 10110010                  CCLR                       SET THE LINK BIT ON LSB
1068.  003352L 00010111 10010010                  SHIFT    SR                RIGHT CIRCULAR
1069.  003353L 00110111 10001111                  LDPT     IMP0              STORE RESULT
1070.  003354L 01101111 11110001                  LDRT     TEMP1
1071.  003355L 01110010 00110001                  DOPR     LUCF,AC,TEMP1,,C0 SET CARRY ON THE MSBIT
       003356L 00110111 00000111
1072.  003357L 01011001 11111011                  BRAX     FETCHN
       003360L 11001111 11110111
1073.                                   *
1074.  003361L                          SRE:
1075.                                   . 1.50   (    032)  SRE              SHIFT RIGHT EXTENDED
1076.                                   . 1.50   (IMP 032)  SRER             R7 <- CRY; R(N-1) <- RN; CRY <- R0
1077.
1078.  003361L 00110001 00110101                  LDTP     UCFLG             GET CARRY
1079.  003362L 00010111 10100010                  SHIFT    SL                IN LSBIT
1080.  003363L 00010111 10110010                  CCLR                       AND INTO LINK
1081.  003364L 00110001 11011111                  LDTP     IMPI
1082.  003365L 00010111 10010010                  SHIFT    SR                DO RIGHT EXTEND
1083.  003366L 00110111 10001111                  LDPT     IMP0
1084.  003367L 00010111 10010010                  SHIFT    SR                PUT LINK IN MSBIT
1085.  003370L 01101111 11110001                  LDRT     TEMP1
1086.  003371L 01110010 00110001                  DOPR     LUCF,AC,TEMP1,,C0 SET CARRY ON LINK
       003372L 00110111 00000111
1087.  003373L 01011001 11111011                  BRAX     FETCHN
       003374L 11001111 11110111
```

```
1088.                                   *
1089.  003375L 11111111 11111111                 TABPAGE  PRODL
       003376L 11111111 11111111
       003377L 11111111 11111111
1090.                                   *
1091.  003400L                          CCS:
1092.                                   . 0.70   (    042)  CCS              CONDITION CODE SAVE
1093.                                   . 0.70   (IMP 042)  CCSr             R <- (CRY)(SGN)0000(~ZRO.SGN)(~ZRN.PTY)
1094.
1095.  003400L 00110001 00110101                 .DOPIP   IMPO,ND,0303,UCFLG
       003401L 01010101 11000011
       003402L 00110111 10001111
1096.  003403L 01011001 11111011                 BRAX     FETCHN
       003404L 11001111 11110111
```

```
1099.                                   *
1100.  003405L                          PLR:
1101.                                   . 3.10   (    1R4)  PLR.IDX        LOAD REGISTER FROM PAGED LOCATION
1102.                                   .        (    105)  PLR.IDX        A-REG LOAD (104 IS NOT A PLR)
1103.                                   .        (    114)  PLR.IDX        R <- (X,IDX)
1104.                                   .        (    124)  PLR.IDX
1105.                                   .        (    134)  PLR.IDX
1106.                                   .        (    144)  PLR.IDX
1107.                                   .        (    154)  PLR.IDX
1108.                                   .        (    164)  PLR.IDX
1109.
1110.                                   . 4.25   (111 124)  DPL.IDX        C <- (X,IDX); B <- (X,IDX+1)
1111.                                   .        (062 114)  DPLR.IDX       B <- (X,IDX); C <- (X,IDX+1)
1112.                                   .        (113 144)  DPL.IDX        E <- (X,IDX); D <- (X,IDX+1)
1113.                                   .        (174 134)  DPLR.IDX       D <- (X,IDX); E <- (X,IDX+1)
1114.                                   .        (115 164)  DPL.IDX        L <- (X,IDX); H <- (X,IDX+1)
1115.                                   .        (176 154)  DPLR.IDX       H <- (X,IDX); L <- (X,IDX+1)
1116.
1117.  003405L 00110111 01000111                STB      SMR              GET THE INDEX
1118.  003406L 00110001 10001001                DLDX     MR2PC            AND SAVE AWAY NEW PC
       003407L 00110001 10101000
1119.  003410L 11010100 11110111                MWAIT    ,MEMPF3
       003411L 11010111 00010100
1120.  003412L 00110001 11100111                LDX      XX2MRH+URX       MSB ADDRESS
1121.  003413L 00110001 00110110                LDPP     MAROL,MDR        LSB ADDRESS
       003414L 00110111 11000000
1122.  003415L 00110111 01000111                STB      SMR              AND GET DATA
1123.  003416L 11001110 11111111                MWAIT    NOOP,MEMPF3
       003417L 11010100 11110000
       003420L 11010111 00010100
1124.  003421L 00110111 00001100                STB      IMAR
1125.  003422L 00110001 00110110                LDPP     I350,MDR         GOT THE DATA
       003423L 00110111 10001101
1126.  003424L 11011001 01000000                BRA      FETPL,T@,IZ      IF IMP NOT ZERO GET ANOTHER BYTE
1127.  003425L 00110111 01000111                STB      SMR
1128.  003426L 11011111 01000100                BRA      DPLOAD
1129.                                   *
1130.  003427L                          PSR:
1131.                                   . 2.20   (    1R6)  PSR.IDX        STORE REG INTO PAGED LOCATION
1132.                                   .        (    107)  PSR.IDX        A REG SAVE (106 IS NOT A PSR)
1133.                                   .        (    116)  PSR.IDX        (X,IDX) <- R
1134.                                   .        (    126)  PSR.IDX
1135.                                   .        (    136)  PSR.IDX
1136.                                   .        (    146)  PSR.IDX
1137.                                   .        (    156)  PSR.IDX
1138.                                   .        (    166)  PSR.IDX
1139.
1140.                                   . 3.35   (111 126)  DPSR.IDX        (X,IDX) <- C; (X,IDX+1) <- B
1141.                                   .        (062 116)  DPSR.IDX       (X,IDX) <- B; (X,IDX+1) <- C
1142.                                   .        (113 146)  DPS.IDX        (X,IDX) <- E; (X,IDX+1) <- D
1143.                                   .        (174 136)  DPSR.IDX       (X,IDX) <- D; (X,IDX+1) <- E
1144.                                   .        (115 166)  DPS.IDX        (X,IDX) <- L; (X,IDX+1) <- H
```

. SINGLE AND DOUBLE PAGED LOAD AND STORE

```
1145.                                .       (176,156)  DPSR.IDX        (X,IDX) <- H; (X,IDX+1) <- L
1146.
1147.  003427L 00110111 01000111             STB     SMR                 GET THE INDEX
1148.  003430L 00110001 10001001             DLDX    MR2PC               UPDATE THE PC SO IT CORRECT
       003431L 00110001 10101000
1149.  003432L 11010100 11100101             MWAIT   ,MEMPF3
       003433L 11010111 00010100
1150.  003434L 00110001 11100111             LDX     XX2MRH+URX          AND MSB ADDRESS FROM X-REG
1151.  003435L 00110001 00110110             LDPP    MAROL,MDR           LSB ADDRESS
       003436L 00110111 11000000
1152.  003437L 00110001 11011101             LDPP    MDW,I35I            SAVE THE REGISTER IN MEMORY
       003440L 00110111 00101001
1153.  003441L 11011000 00111011             BRA     DPSTOR,F@,IZ        STORE MSB IF IMP NON-ZERO
1154.  003442L 01011001 11111011             BRAX    FETCHW
       003443L 11001111 11111100
```

```
                                . REGISTER PAIR INCREMENT AND DECREMENT

1157.                           *
1158.  003444L                  INCPA:
1159.                           . 1.50   (    017)  INCP          HL <- HL + A
1160.                           . 1.35   (062 017)  INCP          BC <- BC + A
1161.                           . 1.35   (174 017)  INCP          DE <- DE + A
1162.                           . 1.35   (022 017)  INCP          XA <- XA + A
1163.                           . +0.65 IF CRY FROM LSB
1164.
1165.  003444L 11011000 11011000          BRA     INCPAS,F@,IZ
1166.  003445L 01010001 00000110          LDPI    LIMP,URL        USE HL IF NO IMP SPECIFICATION
       003446L 00110111 00000001
1167.  003447L 00110001 11010000  INCPAS  LDTP    URI+URA
1168.  003450L 11011111 11001111          BRA     INCPIT          T LOADED WITH VALUE TO ADD, GO DO IT
1169.                           *
1170.  003451L                  INCP:
1171.                           . 1.45   (    015)  INCP          HL <- HL + 1
1172.                           . 1.45   (111 015)  INCP          XA <- XA + 2
1173.                           . 1.30   (062 015)  INCP          BC <- BC + 1
1174.                           . 1.45   (113 015)  INCP          BC <- BC + 2
1175.                           . 1.30   (174 015)  INCP          DE <- DE + 1
1176.                           . 1.45   (115 015)  INCP          DE <- DE + 2
1177.                           . 1.45   (117 015)  INCP          HL <- HL + 2
1178.                           . 1.30   (022 015)  INCP          XA <- XA + 1
1179.                           . +0.65 IF CRY FROM LSB
1180.
1181.  003451L 11011000 11010011          BRA     INCPS,F@,IZ
1182.  003452L 01010001 00000110          LDPI    LIMP,URL        DEFAULT TO HL PAIR
       003453L 00110111 00000001
1183.  003454L 01010001 00000001  INCPS   LDTI    1               ASSUME ITS BY 1 (ODD)
1184.  003455L 11011010 11001111          BRA     INCPIT,F@,IO
1185.  003456L 01010001 00000010          LDTI    2               NO, BY 2 CAUSE WAS EVEN
1186.  003457L 00110111 00001001          STB     DIMP            CORRECT IT TO BE ODD
1187.  003460L 01101111 11110001  INCPIT  LDRT    TEMP1
1188.  003461L 00110001 11011111          DOPRP   IMPFO,AC,TEMP1,IMPI,C0 INC THE LSB (T-SAVE NECESSARY)
       003462L 01110010 00110001
       003463L 00110111 01101111
1189.  003464L 01011001 11111011          BRAX    FETCHN,FC       IF NO CARRY FORGET THE MSB
       003465L 11000000 11110111
1190.  003466L 00110111 00001001          STB     DIMP
1191.  003467L 00110001 11011111          DOPIP   IMPFO,AC,0,IMPI INC THE MSB (COULD USE IT)
       003470L 01010010 00000000
       003471L 00110111 01101111
1192.                           .                               CAN'T USE 'IT IMPFO' BECAUSE DELAYED
1193.                           .                               ALU CARRY THROUGH PROCESSOR CARRY
1194.  003472L 11001111 11110111          BRA     FETCHN
```

```
                                . REGISTER PAIR INCREMENT AND DECREMENT

1195.                           +
1196.  003473L                  DECPA:
1197.                           . 1.50   (     037)  DECP          HL <- HL - A
1198.                           . 1.35   (062 037)  DECP          BC <- BC - A
1199.                           . 1.35   (174 037)  DECP          DE <- DE - A
1200.                           . 1.35   (022 037)  DECP          XA <- XA - A
1201.                           . +0.65 IF BRW FROM LSB
1202.
1203.  003473L 11011000 11000001          BRA     DECPAS,F@,IZ
1204.  003474L 01010001 00000110          LDPI    LIMP,URL        SELECT HL AS DEFAULT REG PAIR
       003475L 00110111 00000001
1205.  003476L 00110001 11010000  DECPAS  LDTP    URI+URA
1206.  003477L 11011111 10111000          BRA     DECPIT          GO DECR. USING A-REG AS DISP.
1207.                           *
1208.  003500L                  DECP:
1209.                           . 1.45   (     035)  DECP          HL <- HL - 1
1210.                           . 1.45   (111 035)  DECP          XA <- XA - 2
1211.                           . 1.30   (062 035)  DECP          BC <- BC - 1
1212.                           . 1.45   (113 035)  DECP          BC <- BC - 2
1213.                           . 1.30   (174 035)  DECP          DE <- DE - 1
1214.                           . 1.45   (115 035)  DECP          DE <- DE - 2
1215.                           . 1.45   (117 035)  DECP          HL <- HL - 2
1216.                           . 1.30   (022 035)  DECP          XA <- XA - 1
1217.                           . +0.65 IF BRW FROM LSB
1218.
1219.  003500L 11011000 10111100          BRA     DECPS,F@,IZ
1220.  003501L 01010001 00000110          LDPI    LIMP,URL
       003502L 00110111 00000001
1221.  003503L 01010001 00000001  DECPS   LDTI    1               EXACTLY LIKE ABOVE BUT USING SB'S NOT A
1222.  003504L 11011010 10111000          BRA     DECPIT,F@,IO
1223.  003505L 01010001 00000010          LDTI    2
1224.  003506L 00110111 00001001          STB     DIMP
1225.  003507L 01101111 11110001  DECPIT  LDRT    TEMP1
1226.  003510L 00110001 11011111          .DOPRP  IMPFO,SB,TEMP1,IMPI,CO
       003511L 01110100 00110001
       003512L 00110111 01101111
1227.  003513L 01011001 11111011          BRAX    FETCHN,FC       IF NO CARRY FORGET THE MSB
       003514L 11000000 11110111
1228.  003515L 00110111 00001001          STB     DIMP
1229.  003516L 00110001 11011111          .DOPIP  IMPFO,SB,0,IMPI
       003517L 01010100 00000000
       003520L 00110111 01101111
1230.  003521L 11001111 11110111          BRA     FETCHN
```

. INDEXED LOCATIONS, INCREMENT AND DECREMENT IN PLACE OR TO REG PAIR

```
1233.                                   *
1234.  003522L                          DECX:
1235.                                   .       (    025)  DECI.LSP.IDX      (X,IDX+1 | X,IDX) <-
1236.                                   . 7.30                               (X,IDX+1 | X,IDX) - DSP
1237.                                   .       (111 025)  DECI.LSP.MSP.IDX (X,IDX+1 | X,IDX) <-
1238.                                   . 8.90                               (X,IDX+1 | X,IDX) - DSP
1239.                                   .       (062 025)  LFID.LSP.IDX     RP <- (X,IDX+1 | X,IDX) - DSP
1240.                                   .       (174 025)  LFID.LSP.IDX
1241.                                   .       (176 025)  LFID.LSP.IDX
1242.                                   . 6.40
1243.                                   .       (113 025)  LFID.LSP.MSP.IDX RP <- (X,IDX+1 | X,IDX) - DSP
1244.                                   .       (115 025)  LFID.LSP.MSP.IDX
1245.                                   .       (117 025)  LFID.LSP.MSP.IDX
1246.                                   . 8.00
1247.
1248.  003522L 00110111 01000111                 STB      SMR              GET DISPLACEMENT LSP
1249.  003523L 01010001 01111001                 BRC      INDX,,DECIT      GO TO INDEX SPECIFYING DECIT SET
       003524L 11011111 10101000
1250.                                   *
1251.  003525L                          INCX:
1252.                                   .       (    005)  INCI.LSP.IDX      (X,IDX+1 | X,IDX) <-
1253.                                   . 7.20                               (X,IDX+1 | X,IDX) + DSP
1254.                                   .       (111 005)  INCI.LSP.MSP.IDX (X,IDX+1 | X,IDX) <-
1255.                                   . 8.80                               (X,IDX+1 | X,IDX) + DSP
1256.                                   .       (062 005)  LFII.LSP.IDX     RP <- (X,IDX+1 | X,IDX) + DSP
1257.                                   .       (174 005)  LFII.LSP.IDX
1258.                                   .       (176 005)  LFII.LSP.IDX
1259.                                   . 6.50
1260.                                   .       (113 005)  LFII.LSP.MSP.IDX RP <- (X,IDX+1 | X,IDX) + DSP
1261.                                   .       (115 005)  LFII.LSP.MSP.IDX
1262.                                   .       (117 005)  LFII.LSP.MSP.IDX
1263.                                   . 8.20
1264.
1265.  003525L 00110111 01000111                 STB      SMR              GET DISPLACEMENT LSP
1266.  003526L 01010001 10001111                 BAL      ,INCIT
```

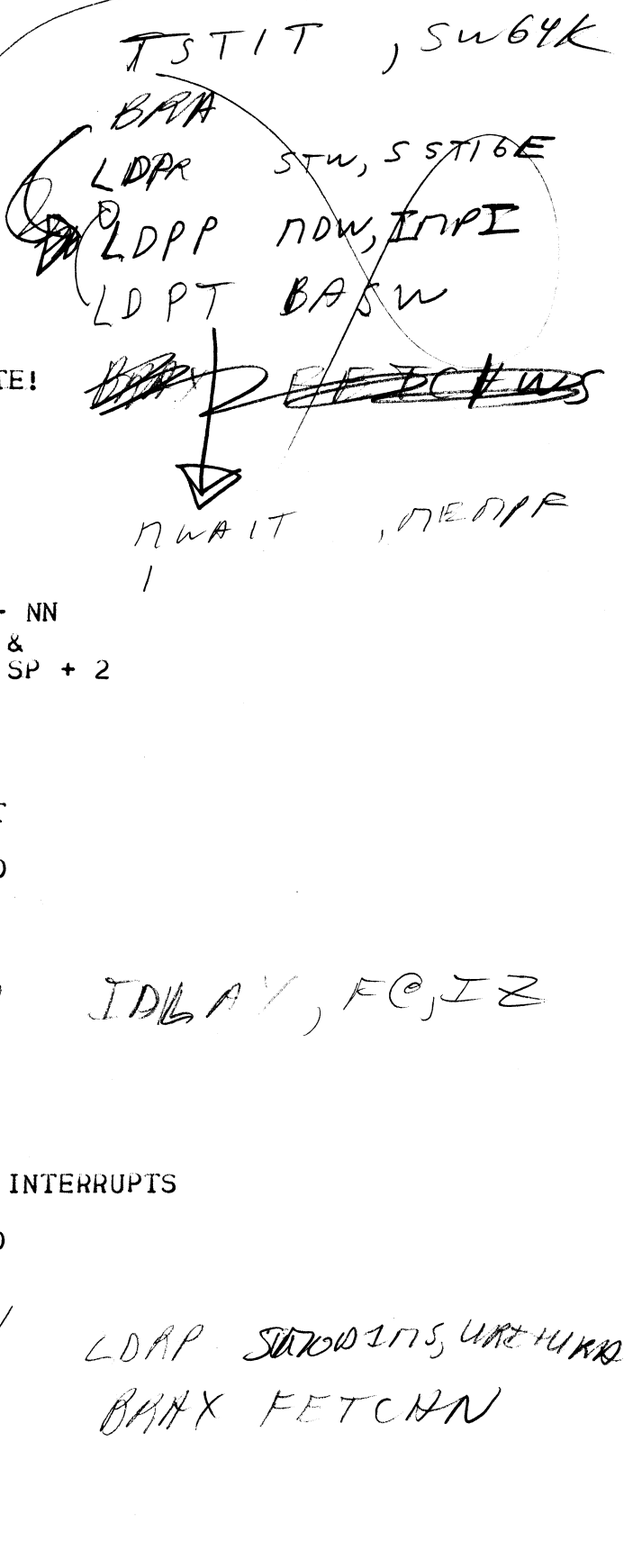
```
1267.
1268.  003527L                          +
                                        INDX
1269.
1270.                                   . INDEXED OPERATIONS TAKES 2 BYTES ON PAGE X-REG ADDS DISPLACEMENT TO IT
1271.                                   .     AND STORES THE RESULT IN A REG. PAIR OR BACK ON TOP OF ITSELF
1272.
1273.  003527L 01101111 11110000              BAS     LINK              FREE REGISTER FOR INC, DEC SELECT
1274.  003530L 11010100 10100111              MWAIT   ,MEMPF3
       003531L 11010111 00010100
1275.  003532L 00110111 00001100              STB     IMAR
1276.  003533L 00110001 00110110              LDRP    TEMPL,MDR         SAVE LSP (LSP DISPLACEMENT)
       003534L 01101111 11110010
1277.  003535L 00110111 01000111              STB     SMR               GET MSP OR INDEX
1278.  003536L 01010001 00000000              TCLR                      ASSUME MSP IS ZERO
1279.  003537L 11011010 10011001              BRA     INDGET,F@,IO
1280.  003540L 11010100 10011111              MWAIT   ,MEMPF3           NO, GET MSP OF DISPLACEMENT
       003541L 11010111 00010100
1281.  003542L 00110111 00001100              STB     IMAR
1282.  003543L 00110001 00110110              LDTP    MDR               GOT MSB
1283.  003544L 00110111 00001001              STB     DIMP,SMR          CORRECT IMP REG AND GET INDEX
       003545L 00110111 01000111
1284.  003546L 01101111 11110001  INDGET      LDRT    TEMPH             SAVE MSP
1285.  003547L 00110001 10001001              DLDX    MR2PC             PC SAVED AS CORRECT VALUE NOW
       003550L 00110001 10101000
1286.  003551L 11010100 10010110              MWAIT   ,MEMPF3           GOT INDEX
       003552L 11010111 00010100
1287.  003553L 00110001 11100111              LDX     XX2MRH+URX        MAR MSB FROM THE X-REG
1288.  003554L 00110001 00110110              LDPP    MAROL,MDR         INDEX TO THE MAR LSB
       003555L 00110111 11000000
1289.  003556L 00110111 01000111              STB     SMR
1290.  003557L 11101111 00000000              BRR     LINK              SELECT DECIT OR INCIT
1291.                                   *
1292.  003560L 11010100 10001111  INCIT       MWAIT   ,MEMPF3
       003561L 11010111 00010100
1293.  003562L 00110111 00001100              STB     IMAR
1294.  003563L 00110001 00110110              DOTRP   ,AC,TEMPL,MDR,C0  ADD DATA AND DISPLACEMENT LSB
       003564L 01110010 00110010
1295.  003565L 00110111 01000111              STB     SMR               START TO READ FOR MSB
1296.  003566L 01101111 11110010              LDRT    TEMPL
1297.  003567L 11010100 10001000              MWAIT   ,MEMPF3
       003570L 11010111 00010100
1298.  003571L 00110001 00110110              DOTRP   ,AC,TEMPH,MDR     ADD MSB PART, LEAVE RESULT IN T
       003572L 01110010 11110001
1299.  003573L 11011000 01101101              BRA     INDXL,F@,IZ       SELECT LOAD REG PAIR OR RELOAD MEMORY
1300.
1301.  003574L 00110111 00101001  INDXS       LDPT    MDW               PUT MSB RESULT BACK IN MEMORY
1302.  003575L 00110111 00000110              LDPT    LUF               SET CONDITION CODES
1303.  003576L 01110001 11110010              LDTR    TEMPL
1304.  003577L 11010100 10000000              MWAIT   ,MEMPF3           PUT LSB DATA BACK ALSO
       003600L 11010111 00010100
1305.  003601L 00110111 00001101              STB     DMAR              IN CORRECT SPOT
1306.  003602L 11011111 01111100              DELAY   2
```

```
1307.  003603L 00110111 00101001          LDPT    MDW
1308.  003604L 01011001 11111011          BRAX    FETCHW
       003605L 11001111 11111100
1309.
1310.  003606L 11010100 01111001  DECIT    MWAIT   ,MEMPF3
       003607L 11010111 00010100
1311.  003610L 00110111 00001100          STB     IMAR
1312.  003611L 00110001 00110110          DOTRP   ,SB,TEMPL,MDR,C0   SUBTRACT DISPLACEMENT FROM THE DATA
       003612L 01110100 00110010
1313.  003613L 00110111 01000111          STB     SMR               START TO READ FOR MSB FAST
1314.  003614L 01101111 11110010          LDRT    TEMPL
1315.  003615L 11010100 01110010          MWAIT   ,MEMPF3
       003616L 11010111 00010100
1316.  003617L 00110001 00110110          DOTRP   ,SB,TEMPH,MDR     SIMILARLY FOR THE MSB PART
       003620L 01110100 11110001
1317.  003621L 11011001 10000011          BRA     INDXS,T@,IZ       SELECT LOAD REG PAIR OR RELOAD MEMORY
1318.
1319.  003622L 00110111 00001001  INDXL    STB     DIMP              CORRECT POINTER TO MSB
1320.  003623L 00110111 01101111          LDPT    IMPFO,IIMP        LOAD THE INDEX INTO A REGISTER PAIR
       003624L 00110111 00001000
1321.  003625L 01110001 11110010          LDPR    IMPO,TEMPL        THE LSB ALSO
       003626L 00110111 10001111
1322.  003627L 01011001 11111011          BRAX    FETCH
       003630L 11001111 11111010
```

```
                                . DOUBLE LOADS AND DOUBLE STORES
1325.                           *
1326.  003631L                  DS:
1327.                           . 3.35  (    027)  DS            (HL) <- E; (HL+1) <- D
1328.                           . 4.05  (111 027)  DS            (HL) <- C; (HL+1) <- B
1329.                           . 3.35  (113 027)  DS            (DE) <- C; (DE+1) <- B
1330.                           . 3.20  (174 027)  DS            (BC) <- E; (BC+1) <- D
1331.                           . 3.20  (176 027)  DS            (BC) <- L; (BC+1) <- H
1332.                           . 3.35  (117 027)  DS            (DE) <- L; (DE+1) <- H
1333.
1334.  003631L 01010001 00111110          BRC     DLS,,DSTORE     SELECT REG PAIRS & DO SAVE
       003632L 11011111 01011111
1335.                           *
1336.  003633L                  DLHL:
1337.                           . 3.95  (    057)  DL            L <- (HL); H <- (HL+1)
1338.
1339.  003633L 01010001 01001101          BAL     LINK,DLOAD      LOAD REG PAIR
       003634L 01101111 11110000
1340.  003635L 01010001 00000110          LDTI    URL             HL
1341.  003636L 11011111 01010001          BRA     DLSLMP          FROM (HL)
1342.                           *
1343.  003637L                  DL:
1344.                           . 3.95  (    047)  DL            E <- (HL); D <- (HL+1)
1345.                           . 4.65  (111 047)  DL            C <- (HL); B <- (HL+1)
1346.                           . 3.80  (062 047)  DL            C <- (BC); B <- (BC+1)
1347.                           . 3.95  (113 047)  DL            C <- (DE); B <- (DE+1)
1348.                           . 3.80  (174 047)  DL            E <- (BC); D <- (BC+1)
1349.                           . 3.95  (115 047)  DL            E <- (DE); D <- (DE+1)
1350.                           . 3.80  (176 047)  DL            L <- (BC); H <- (BC+1)
1351.                           . 3.95  (117 047)  DL            L <- (DE); H <- (DE+1)
1352.
1353.  003637L 01010001 01001101          BAL     ,DLOAD          LOAD SELECT
1354.                           *
1355.  003640L                  DLS                             DECODE ADDRESS & REG SPEC. OPERATORS
1356.
1357.  003640L 01101111 11110000          BAS     LINK
1358.  003641L 11011001 01010010          BRA     DLSZRO,T@,IZ    DE,HL - 000
1359.  003642L 11011010 01010111          BRA     DLSBC,F@,IO     XX,BC - 062, 114...
1360.  003643L 00110111 00001001          STB     DIMP
1361.  003644L 00110001 11000100          LDX     DE2MRL          DELAY ONE FROM THE DIMP BEFORE BRA
1362.  003645L 11011001 01010100          BRA     DLSONE,T@,IZ    BC,HL - 111
1363.  003646L 00110001 11100011          LDX     DE2MRH
1364.  003647L 11101111 00000000          BRR     LINK            XX,DE - 113, 115...
1365.  003650L 00110001 11000010  DLSBC   LDX     XX2MRL+URC
1366.  003651L 00110001 11100001          LDX     XX2MRH+URB      XX,BC - 062, 114...
1367.  003652L 11101111 00000000          BRR     LINK
1368.  003653L 01010001 00000010  DLSONE  LDTI    URC             BC,HL - 111
1369.  003654L 11011111 01010001          BRA     DLSLMP
1370.  003655L 01010001 00000100  DLSZRO  LDTI    URE             DE,HL - 000
1371.  003656L 00110111 00000001  DLSLMP  LDPT    LIMP
1372.  003657L 00110001 11000110          DLDX    HL2MR           XX,HL - 000, 111, HL,HL
       003660L 00110001 11100101
1373.  003661L 11101111 00000000          BRR     LINK
```

```
1374.                                   *
1375.  003662L                         DLOAD                                LOAD REGISTER PAIR FROM MEMORY
1376.
1377.  003662L 00110111 01000111                 STB     SMR
1378.  003663L 11001110 11111111                 MWAIT   NOOP,MEMPF3
       003664L 11010100 01001011
       003665L 11010111 00010100
1379.  003666L 00110111 00001100                 STB     IMAR
1380.  003667L 00110001 00110110                 LDPP    IMPO,MDR             GET THE LSB DATA
       003670L 00110111 10001111
1381.  003671L 00110111 01000111                 STB     SMR,DIMP
       003672L 00110111 00001001
1382.  003673L 11010100 01000100         DPLOAD  MWAIT   ,MEMPF3
       003674L 11010111 00010100
1383.  003675L 00110001 00110110                 LDPP    IMPO,MDR             GET THE MSB
       003676L 00110111 10001111
1384.  003677L 01011001 11111011         FETPL   BRAX    FETCH
       003700L 11001111 11111010
1385.                                   *
1386.  003701L                         DSTORE                               SAVE REGISTER PAIR IN MEMORY
1387.
1388.  003701L 00110001 11011111                 LDPP    MDW,IMPI,DIMP        OUTPUT LSB AND POINT TO MSB
       003702L 00110111 00101001
       003703L 00110111 00001001
1389.  003704L 00110001 11011111         DPSTOR  LDTP    IMPI
1390.  003705L 11010100 00111010                 MWAIT   ,MEMPF3
       003706L 11010111 00010100
1391.  003707L 00110111 00001100                 STB     IMAR
1392.  003710L 11011111 00110110                 DELAY   2
1393.  003711L 00110111 00101001                 LDPT    MDW                  OUTPUT MSB
1394.  003712L 01011001 11111011                 BRAX    FETCHW
       003713L 11001111 11111100
```

```
1397.
1398.  003714L                                *
1399.                                        BRL:
1400.                                        . 1.80   (   072)  BRL          BASE REGISTER LOAD
1401.                                        .        (IMP 072)  BRL          BASE <- (SEBRLS) <- R
1402.  003714L 00110001 11011100                      TSTIP    ,SWUSER,PSWI
       003715L 01000101 00000100
1403.  003716L 11010010 00010110                      BRA      IVIOL3,FZ
1404.  003717L 01010001 10101011                      DLDPI    MARO,SEBRLS    SAVE BASE REG VALUE AWAY
       003720L 00110111 11000000
       003721L 01010001 11101111
       003722L 00110111 11100000
1405.  003723L 00110001 11011111                      LDPP     BASW,IMPI      LOAD BASE REG BEFORE WRITE!
       003724L 00110111 00000011
1406.  003725L 00110111 00101001                      LDPT     MDW
1407.  003726L 01011001 11111011                      BRAX     FETCHW
       003727L 11001111 11111100
1408.                                        *
1409.  003730L                                EI:
1410.                                        . 1.05   (   050)  EI           ENABLE INTERRUPTS
1411.                                        . 4.10   (111 050)  EJMP.LSB.MSB ENABLE INTERRUPTS & PC <- NN
1412.                                        . 6.40   (062 050)  EUR          ENABLE INTERRUPTS & USER &
1413.                                        .                               PC <- (SP+1 | SP); SP <- SP + 2
1414.
1415.  003730L 00110001 11011100                      TSTIP    ,SWUSER,PSWI   NOT ALLOWED IN USER MODE
       003731L 01000101 00000100
1416.  003732L 11010010 00010110                      BRA      IVIOL3,FZ
1417.  003733L 01010011 00000001                      DOPI     PSWO,OR,SWINTE SET THE INTERRUPTS ON BIT
       003734L 00110111 10001100
1418.  003735L 00110111 00000100                      LDPT     MODW           IN EMULATION SUPPORT ALSO
1419.  003736L 01011001 11111011                      BRAX     FETCHN,T@,IZ   WAS SIMPLE EI
       003737L 11001001 11110111
1420.  003740L 11001111 10011101                      BRA      EIROJ          WAS EJMP OR EUR
1421.                                        *
1422.  003741L                                DI:
1423.                                        . 1.05   (   040)  DI           DISABLE INTERRUPTS
1424.
1425.  003741L 00110001 11011100                      TSTIP    ,SWUSER,PSWI   NOT ALLOWED IN USER MODE
       003742L 01000101 00000100
1426.  003743L 11010010 00010110                      BRA      IVIOL3,FZ
1427.  003744L 01010101 11111110                      DOPI     PSWO,ND,-1-SWINTE RESET ~~THE~~ BIT, DISABLING INTERRUPTS
       003745L 00110111 10001100
1428.  003746L 00110111 00000100                      LDPT     MODW           IN EMULATION SUPPORT ALSO
1429.  003747L 01011001 11111011                      BRAX     FETCHN
       003750L 11001111 11110111
```



```
1430.
1431.  >003751L 01011001 11111111          IVIOL3    BRAX     IVIOL$
       >003752L 11001111 11111111
1432.                                       .
1433.   003753L 01011001 11111011          MEMPF3    BRAX     MEMPF$
        003754L 11001111 01101110
1434.                                       .
1435.   003755L 11111111 11111111                    TABPAGE  PRODL
        003756L 11111111 11111111
        003757L 11111111 11111111
        003760L 11111111 11111111
        003761L 11111111 11111111
        003762L 11111111 11111111
        003763L 11111111 11111111
        003764L 11111111 11111111
        003765L 11111111 11111111
        003766L 11111111 11111111
        003767L 11111111 11111111
        003770L 11111111 11111111
        003771L 11111111 11111111
        003772L 11111111 11111111
        003773L 11111111 11111111
        003774L 11111111 11111111
        003775L 11111111 11111111
        003776L 11111111 11111111
        003777L 11111111 11111111
1436.   002000                          PRODLEN   EQU      $-PRODP
1437.   002000                                    USE      PRODL
1438.   002000                                    SKIP     PRODLEN
1439.                                             END
```

DL PPI MARQ, SE BALS
TSTIP , SWUSER, PSWI
BRA IVIOL3, FZ
TSTIT , SW64K
BRA , FZ
LDPP BASW, IMPI
LDPT NOW
BRAX FETCHW

LDPR STW, SSTIGE
LDPP BASW, IMPI
LDPT NOW
NOOP
MWAIT NOOP, RETURN
LDPR STW, LSTIGE
BRAX FETCH

	AC	226	278	325	579	607	618	623	756	820	829	845	851
		939	943	944	1000	1006	1040	1045	1047	1058	1071	1086	1188
		1191	1294	1298									
002724	AC$DO	*745											
010015	ACD	*35:I	724	726	741	770	778	782					
002740	ACEND	*769	761										
002755	ACHOUT	*782	775										
002741	ACLOUT	*770	759	765	767	777							
002736	ACSHRT	*766	763										
002745	ACSIG	*774	757										
002567	ALUOP	*571	548	560									
002632	ALUXQT	*623	579										
002542	AP4	*522											
002551	AP7	*550											
002565	APS	*562											
	B0	64:I											
	B1	65:I											
	B2	66:I											
	B3	67:I											
	B4	68:I	707	708	709	710	711	758					
	B5	69:I	708	711	762	776							
	B6	70:I	709	710	711	760	774						
	B7	71:I	707	708	709	710	711	756					
	BASW	1405											
003123	BCP	*888											
002703	BEEP	*716											
003221	BFAC	*979											
003263	BFADD	*1006	986										
003224	BFOP	*988	932	934	977								
003273	BFS	*1016											
003215	BFSB	*970											
003321	BFSL	*1043	1028										
003267	BFSUB	*1010	977										
000203	BPINIT	*707	720										
000253	BPSHRT	*708	736										
020006	BR	*19:I											
003714	BRL	*1398											
003000	BT	*790											
003065	BTCVT	*844	837										
003100	BTEND	*851	823										
003002	BTR	*814											
003031	BTV	*825	812										
003053	BTX	*839	811										
000177	BYPLVL	*714	783										
	C0	586	607	618	820	845	851	1040	1058	1071	1086	1188	1226
		1294	1312										
	C1	847	906	910	1030								
002032	CALL	*105											
002026	CALLCC	*87											
000000	CAP551O	*70:I	73:I										
000060	CAPABILI	*73:I											
000000	CAPAPF	*67:I	73:I										

000000	CAPBLUE	*66:I	73:I									
000000	CAPCOM	*71:I	73:I									
000020	CAPDMPIO	*68:I	73:I									
000000	CAPIMA	*65:I	73:I									
000000	CAPMICR	*64:I	73:I									
000040	CAPRIM	*69:I	73:I									
	CC	122	159	218	253	266	347	577	579	591	596	601	741
		821	826	856	911	957	991	996	1032	1033	1036	1038	1043
		1067	1068	1079	1080	1082	1084						
003400	CCS	*1091											
007000	CDOR	*81:I											
006000	CDOX	*80:I											
	CF	114	117	150	283	451	455	544	555	567	575	576	606
		612	617	623	678	721	724	726	770	778	782	815	835
		840	846	908	930	937	943	946	976	985	994	1001	1006
		1010	1039	1057	1070	1085	1187	1225	1273	1276	1284	1296	1298
		1303	1314	1316	1321	1339	1357						
	CHUF	740											
002715	CLICK	*728											
002704	CLICKS	*721	735	737									
000360	CLKINI	*711	734										
000340	CLKLVL	*713	779										
	COMF	677											
	DE2MRH	819	825	844	905	997	1363						
	DE2MRL	819	825	844	905	997	1361						
003606	DECIT	*1310	1249										
003500	DECP	*1208											
003473	DECPA	*1196											
003476	DECPAS	*1205	1203										
003507	DECPIT	*1225	1206	1222									
003503	DECPS	*1221	1219										
003522	DECX	*1234											
003172	DFADD	*942	931										
003200	DFAEND	*947	938	940	945								
003157	DFOP	*919	904										
003165	DFSUB	*936	933										
003741	DI	*1422											
	DIMP	135	173	233	271	327	386	489	509	1186	1190	1224	1228
		1283	1319	1360	1381	1388							
003637	DL	*1343											
	DL$DO	671											
002665	DLDO	*671	654										
003633	DLHL	*1336											
003662	DLOAD	*1375	1339	1353									
003640	DLS	*1355	1334										
003650	DLSBC	*1365	1359										
003656	DLSLMP	*1371	1341	1369									
003653	DLSONE	*1368	1362										
003655	DLSZRO	*1370	1358										
000310	DLYLNG	*709	764										
000316	DLYSRT	*710	766										
	DMAR	350	817	1305									

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003673  DPLOAD      *1382   1128
003704  DPSTOR      *1389   1153
003631  DS          *1326
003701  DSTORE      *1386   1334
003730  EI          *1409
002142  EIROJ        *180   1420
002005  FETCH         *65    253    391    494   1322   1384
002013  FETCHL        *69    244    477
002010  FETCHN        *67    151    209    442    456    518    587    592    597    602    613    624
                     725    727   1060   1072   1087   1096   1189   1194   1227   1230   1419   1429
002000  FETCHRW       *59    159    176
002003  FETCHW        *63    508    511    966   1154   1308   1394   1407
002017  FETLIMP       *75    402    417
003677  FETPL       *1384   1126
004000  FLEX         *79:I
        HL2MRH         323    345    487    506    556    814    839    909    992   1027   1372
        HL2MRL         323    345    487    506    556    814    839    909    992   1027   1372
002721  HUMDO         *739    658
        I02I           507    510    517    568
        I35I          1152
        I350           475    493    517   1125
        IDCODH          79    882
        IDCODL          79    882
        IIMP           175    279    323    352    388   1320
        IM2MRH         387    489    509
        IM2MRL         489    509
        IMAR            65     77    113    118    138    170    231    327    441    450    474    547
                       558    842   1124   1275   1281   1293   1311   1379   1391
        IMP8           400
        IMPFO          591    596    601    612    623   1188   1191   1226   1229   1320
        IMPH           346
        IMPI           134    136    276    324    328    384    586    591    596    601    612    623
                      1057   1066   1081   1188   1191   1226   1229   1388   1389   1405
        IMPL           168    270    321
        IMPO           171    175    232    236    278    351    355    388    389   1059   1069   1083
                      1095   1321   1380   1383
003560  INCIT       *1292   1266
003451  INCP        *1170
003444  INCPA       *1158
003447  INCPAS      *1167   1165
003460  INCPIT      *1187   1168   1184
003454  INCPS       *1183   1181
003525  INCX        *1251
003546  INDGET      *1284   1279
003527  INDX        *1268   1249
003622  INDXL       *1319   1299
003574  INDXS       *1301   1317
020005  IO           *18:I    185    344    735    812    932   1184   1222   1279   1359
        IT             325    832    847    906    910   1030   1059
        ITW            724    851
        IVIOL$         419   1431
002437  IVIOL2        *419    383    399    414    723
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003751	IVIOL3	*1431	1403	1416	1426								
020004	IZ	*17:I	101	159	253	320	399	414	486	505	811	904	1028
		1126	1153	1165	1181	1203	1219	1299	1317	1358	1362	1419	
002447	JUMP	*444	185	436									
002441	JUMPCC	*423											
010001	KBSCNT	*26:I											
002523	L7S	*497											
002531	L7SI	*509	505										
002467	LD6	*460											
002502	LD7	*479											
002514	LD7CMN	*492	488										
002507	LD7I	*489	486										
002537	LDS	*513											
	LIMP	69	111	160	168	215	254	270	321	329	346	357	400
		415	1166	1182	1204	1220	1371						
030000	LINK	*41:I	122	141	159	218	237	253	579	580	991	1004	1273
		1290	1339	1357	1364	1367	1373						
	LIREG	78											
	LSPKR	771	779	783									
	LUCF	1040	1048	1058	1071	1086							
	LUF	586	913	937	944	1007	1011	1302					
	MARIH	822	847	906	910	993	998	1030	1044				
	MARIL	822	847	906	910	993	998	1030	1044				
	MAROH	150	275	454	832	1404							
	MAROL	133	150	275	385	455	829	1121	1151	1288	1404		
	MDR	78	114	117	171	175	232	236	278	351	355	451	454
		475	493	546	559	820	829	845	908	913	996	1003	1035
		1047	1121	1125	1151	1276	1282	1288	1294	1298	1312	1316	1380
		1383											
	MDW	134	140	324	328	507	510	820	845	947	1006	1010	1037
		1047	1152	1301	1307	1388	1393	1406					
002250	MEMNBAS	*279	274										
002272	MEMPA	*295	288										
002221	MEMPFS	*260	112	116	148	169	174	230	238	326	354	358	1433
002220	MEMPF2	*259	63	75	449	453	473	495	545	557	631	662	680
003753	MEMPF3	*1433	816	828	836	841	881	907	912	995	1002	1034	1046
		1119	1123	1149	1274	1280	1286	1292	1297	1304	1310	1315	1378
		1382	1390										
002077	MEMPFPS	*141	137										
002253	MEMPQ	*281	277										
002275	MEMPR	*299	296										
002270	MEMPS	*292	284										
002274	MEMPW	*298	286										
002266	MEMPX	*290	282	293									
020002	MO	*15:I	59	63	75	112	116	137	148	169	174	230	234
		277	282	326	349	354	358	449	453	473	492	545	557
		631	662	680	816	828	836	841	881	907	912	995	1002
		1034	1046	1119	1123	1149	1274	1280	1286	1292	1297	1304	1310
		1315	1378	1382	1390								
	MODW	61	129	149	223	235	269	359	663	1418	1428		
020003	MP	*16:I	63	75	112	116	137	148	169	174	230	277	282
		326	349	354	358	449	453	473	492	494	545	557	631

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                    662    680    816    828    836    841    881    907    912    995   1002   1034
                   1046   1119   1123   1149   1274   1280   1286   1292   1297   1304   1310   1315
                   1378   1382   1390
          MR2HLH    818    843
          MR2HLL    818    843
          MR2IMH    271
          MR2IML    271
          MR2PCH     67    119    173    401    416    476   1118   1148   1285
          MR2PCL     67    119    173    401    416    476   1118   1148   1285
          MR2SPH    390
          MR2SPL    390
002444    NOJ      *438    103
002667    OMDO     *673    656
          PC2MRH     65    243    558    668
          PC2MRL     65    243    558    668
          PCL       111    215
002100    PCMOD    *145    120
010000    PDLNP     *25:I
003405    PLR      *1100
002212    POP      *246
002155    POPSTO   *218    322
002156    POPSTK   *219    253    255
000107    PRE        *3:I
000000    PROC      *77:I
002000    PROD      *78:I   47
002000    PRODL     *49     51    365    786   1089   1435
002000    PRODLEN  *1436   1438
002000    PRODP     *51   1436
002054    PSHSTO   *122    176    280    356
002055    PSHSTK   *123    159    161
003427    PSR      *1130
          PSWI       61    129    149    192    223    235    269    359    382    630    663    682
                    722    965   1402   1415   1425
          PSWO      192    630    965   1417   1427
002111    PUSH     *153
002117    PUSHI    *163
010002    Q         *23:I  347    577    826    847    856    906    910    957   1030   1032   1033
                   1036   1038   1043   1067   1068   1079   1080   1082   1084
002147    RETCC    *196
002206    RETS     *240    216
002152    RETURN   *211    194
000014    REV        *2:I
003202    RIN16    *952    330    360   1008   1012   1041   1049
003105    RIN256   *860    852    914
003210    RIND     *962    853    868    915
003115    RINDO    *881    870
003121    RINRPT   *884    880
003113    RINST    *873    960
          SB         131   348    353    586    612    822    867    913    937    958    993    998
                    1010   1044   1226   1229   1312   1316
010002    SCANSV    *27:I
          SCDON      681   683
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	SCDSPNL	653											
	SCHUMS	657											
	SCLST	684											
	SCONMS	655											
	SCRAMI	299											
	SCROMLI	290											
	SEBRLS	275	1404										
002421	SIRO	*395											
002430	SIRX	*404											
	SL	1032	1079										
003341	SLC	*1053											
	SMR	67	110	115	167	172	224	233	243	275	345	352	398
		413	448	452	472	475	487	491	543	556	668	814	825
		834	839	905	909	992	997	1027	1117	1122	1127	1147	1248
		1265	1277	1283	1289	1295	1313	1377	1381				
	SP2MRH	130	222										
	SP2MRL	224											
	SPIH	388											
	SPIL	131	389										
	SPOL	132	229										
	SR	577	1036	1038	1068	1082	1084						
003350	SRC	*1062											
003361	SRE	*1074											
	SRMEMPE	289											
	SRSTPE	292											
	SRSYSMF	281											
002645	SRVDO	*641	72										
002017	SRVEND	*74	669										
002024	SRVID	*79	665										
002643	SRVNXT	*633	742	772	780	784							
	SRVREQ	71	638	879									
002636	SRVRPT	*628	884										
002653	SRVRTW	*660	639										
	STATUS	102	208	435									
	STEK	266											
002330	STKL	*332	320										
002351	STKLPF	*353	349										
002277	STKS	*303											
	STLA	287											
	STLSP	283											
	STLW	285											
	STUSCF	102	208	435									
	SVAVIOL	295											
	SVONEMS	678											
	SVWVIOL	298											
	SWINTE	1417	1427										
	SWRPT	630	664	682	965								
	SWUSER	129	192	223	269	382	722	1402	1415	1425			
002400	SYSM	*367	344										
002372	SYSRET0	*362											
	SYSRET1	363											
030001	TEMP1	*42:I	44:I	266	283	451	455	575	586	591	596	601	612

		623	721	726	815	820	821	835	840	845	846	851	908
		911	937	943	946	996	1006	1010	1039	1040	1057	1058	1070
		1071	1085	1086	1187	1188	1225	1226					
030002	TEMP2	*43:I	45:I	544	555	567	576	606	607	617	618	930	976
		985	994	1001									
030001	TEMPH	*44:I	117	150	678	1284	1298	1316					
030002	TEMPL	*45:I	114	150	678	1276	1294	1296	1303	1312	1314	1321	
000003	TYPE	*5:I											
	UCFLG	606	617	1000	1031	1045	1078	1095					
	UDEH	822	847	906	998								
	UDEL	822	847	906	998								
	URA	815	830	840	1167	1205							
	URB	851	947	1366									
	URC	867	958	1365	1368								
	URE	1370											
	URH	325	353	831	910	993	1030	1044					
	URI	325	348	353	815	827	831	840	851	867	947	958	1167
		1205											
	URL	160	254	325	348	827	910	993	1030	1044	1166	1182	1204
		1220	1340										
	URO	325	348	353	822	830	847	867	906	910	958	993	998
		1030	1044										
	URX	1120	1150	1287									
002143	USERET	*187	101										
000002	VER	*1:I											
	XX2MRH	1120	1150	1287	1366								
	XX2MRL	1365											