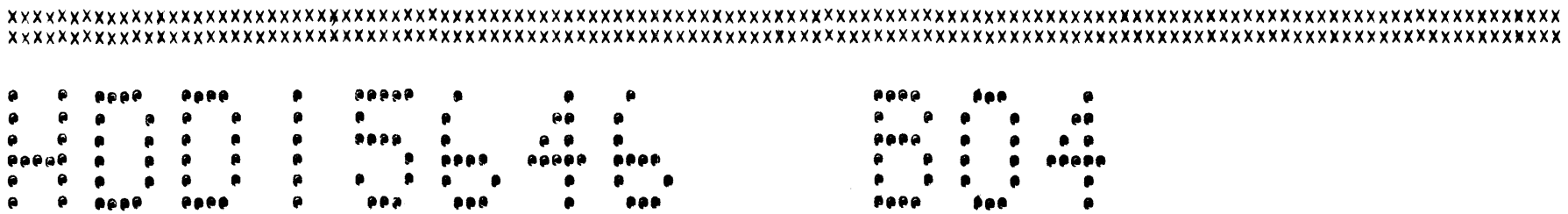

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```
**********************************
**********************************
**                              **
**  PDP-9 MINI TIME-SHARING SYSTEM  **
**   MEMORY PROTECTION OVERLAY #2   **
**              DTSS:MP2            **
**               DK0:B04            **
**               TPN:B04            **
**                              **
**********************************
**********************************
```

```
100             .NAME   MP2--B04
110             .INSRT  MP0
100             .TITLE  ROUTINES TO SERVICE MEMORY PROTECT VIOLATIONS
110             .HEAD   M
120             .INSRT  DEFINS
100             .IFUND  DEFINS
```

```
5720            .LIST   ON
5730            .END
130             .HEAD   M
```

```
                M                       MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

                        140             .STITL  MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS
                        150
                        160
                        170     TABLE   .DEFIN                  IOT TABLE ENTRY
                        180             .PMC    SAVE,OFF
                        190             #1/16.+740000
                        200             .PMC    RESTORE
                        210             .ENDM
    001000              220             .LOC    OVSTRT
    000702              230     INSTR   .EQU    $OC0
    000702              240     TEMP2   .EQU    $OC0
    000703              250     OPCOD   .EQU    $OC1
    000703              260     TEMP3   .EQU    $OC1
    000704              270     TEMP4   .EQU    $OC2
    000705              280     TEMP5   .EQU    $OC3
001000  601027          290     MPSTRT  JMP     MPST            OVERLAY ENTRANCE VECTOR
001001  601006          300             JMP     PINT-1          ENTRANCE FOR PROGRAM INTERRUPT SIMULATION
001002  601214          310             JMP     IOT0
001003  001265          320             RDBLK                   POINTER TO THE ROADBLOCK ROUTINE
001004  601365          330             JMP     .OPR,           POINTER TO OPERATE HANDLING
001005  000000          340     PINST   .DSA                    PERMANENT INSTRUCTION SAVE IN CASE IT IS A GRAPHICS II INSTRUCTION
                        350     *
                        360     *       AN IOT INTERRUPT HAS OCCURRED -- GENERATE A USER PI INTERRUPT IF THE PI SYSTEM IS ON
                        370     *       TREAT AS IF LOCATION 1 CONTAINED AN XCT OF THE USER'S LOCATION 1 -- ONE XCT IS STILL LEGAL
                        380     *
001006  101162          390             JMS     REGSAVE
001007  100525          400     PINT    JMS     SIO,OT          SAVE USER TEMPS
001010  201760          410             LAC     SIORS           LOAD THE USER'S IORS WORD
001011  740110          420             SMA!RAL
001012  600270          430             RET     SPIDON          EXIT IF PI SYSTEM IS NOT ENABLED
001013  744020          440             CLL!IRAR
001014  041760          450             DAC     SIORS           ELSE TURN OFF THE PI SYSTEM
001015  200000          460             LAC     0
001016  501621          470             AND     (677777)        REMOVE THE MEMORY PROTECT BIT
001017  041713          480             DAC     $,0             SET THE USER PC IN HIS LOCATION 0
001020  500634          490             AND     SBIT0           SAVE THE LINK STATUS
001021  341622          500             TAD     (100001)
001022  040000          510             DAC     0               FAKE THE NEXT INSTRUCTION CAME FROM LOCATION 1 WITH MEMORY PROTECT ON
001023  201714          520             LAC     $,0+1           LOAD THE USER'S LOCATION 1 INSTRUCTION
001024  140704          530             DZM     TEMP4           INITIALIZE THE COUNT OF MEMORY OVERLAY EXCHANGES
001025  140705          540             DZM     TEMP5           INITIALIZE THE XCT COUNT
001026  601042          550             JMP     MP111+1         AND CHECK THE INSTRUCTION
                        560
                        570
                        580
    001027              590     MPST    ...
001027  101162          600             JMS     REGSAVE         SAVE THE MQ AND SC
001030  140704          610             DZM     TEMP4           INITIALIZE THE COUNT OF MEMORY OVERLAY EXCHANGES
001031  140705          620             DZM     TEMP5           INITIALIZE THE XCT COUNT (CHECK FOR XCT LOOPS)
                        630     *
                        640     *       CHECK TO SEE IF THE VIOLATION WAS CAUSED BY AN ATTEMPT TO TRANSFER TO PROTECTED MEMORY
                        650     *
```

M MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

```
001032  200000  660           LAC     0               LOAD THE USER PC
001033  500651  670           AND     $ADRSS          GET RID OF NON-ADDRESS BITS
001034  341623  680           TAD     (-BOUNDARY)
001035  755101  690           SPA!CLA!CMA!CLL         SKIP UNLESS A TRANSFER TO PROTECTED MEMORY WAS REQUESTED
001036  601240  700           JMP     ERR1            YES -- VIOLATION WAS A TRANSFER TO PROTECTED MEMORY -- ILLEGAL
                710     *
                720     *       THE VIOLATION WAS NOT CAUSED BY AN ATTEMPT TO TRANSFER TO PROTECTED MEMORY
                730     *       NOW GET THE VIOLATING INSTRUCTION AND SEPARATE OUT ITS OP CODE
                740     *
001037  340000  750           TAD     0               YIELDS LOCATION OF THE OFFENDING INSTRUCTION AND SETS THE LINK
001040  040702  760           DAC     INSTR
001041  220702  770   MP111   LAC     INSTR,X
001042  040702  780           DAC     INSTR           INSTR CONTAINS THE BAD INSTRUCTION
001043  041005  790           DAC     PINST           SAVE THE INSTRUCTION IN CASE IT IS A GRAPHICS II INSTRUCTION
001044  501624  800           AND     (NOP)
001045  741200  810           SNA
001046  601236  820           JMP     ERR3            CAL IS AN ILLEGAL INSTRUCTION
001047  040703  830           DAC     OPCOD           SAVE THE OP CODE OF THE VIOLATING INSTRUCTION
                840     *
                850     *       NOW CHECK FOR A MICRO-CODED INSTRUCTION: OPERATE OR IOT
                860     *
001050  541625  870           SAD     (EAE)
001051  601115  880           JMP     O.K.            EAE INSTRUCTIONS ARE INNOCENT
001052  541624  890           SAD     (OPR)
001053  601365  900   OPRST   JMP     .OPR.           OPERATE INSTRUCTION VIOLATION
001054  541626  910           SAD     (IOT)
001055  601202  920           JMP     .IOT.           SERVICE IOT VIOLATION
```

M MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

```
                    930             .EJECT
                    940     *
                    950     *       NOT A MICROCODED INSTUCTION, SO ESTABLISH THE EFFECTIVE INSTRUCTION
                    960     *
 001056  200702     970             LAC     INSTR
 001057  501627     980             AND     (020000)
 001060  741200     990             SNA                     SKIP IF THE VIOLATING INSTRUCTION HAD THE INDIRECT BIT ON
 001061  601073    1000             JMP     MPBA1           ELSE CARRY ON NORMALLY
 001062  200702    1010             LAC     INSTR           LOAD THE ORIGINAL INSTRUCTION
 001063  501630    1020             AND     (17770)         RETAIN THE ADDRESS ONLY -- DELETING THE LOW ORDER THREE BITS
 001064  541631    1030             SAD     (10)            SKIP IF ADDRESSED LOCATION WAS NOT AUTO-INDEX REGISTER
 001065  460702    1040             INX     INSTR,X         ELSE INCREMENT THE LOCATION
 001066  740000    1050             NOP                     IT JUST MIGHT SKIP
 001067  220702    1060             LAC     INSTR,X
 001070  500651    1070             AND     $ADRSS          RECOVER THE EFFECTIVE ADDRESS
 001071  240703    1080             XOR     OPCOD           AND ADD THE OP CODE BACK IN
 001072  040702    1090             DAC     INSTR           SAVE THE (CONSTRUCTED) EFFECTIVE INSTRUCTION
                    1100    *
                    1110    *       VIOLATION WAS A MEMORY REFERENCE INSTRUCTION (OTHER THAN CAL, JMP, JMS, OR XCT)
                    1120    *       WHICH ATTEMPTED TO REFERENCE A LOCATION BELOW THE BOUNDARY,
                    1130    *       OR THE VIOLATION WAS AN XCT OR PI INTERRUPT AND THE REFERENCE MAY NOT BE TO PROTECTED MEMORY
                    1140    *       REFERENCES TO 0-7 & 21-27 MUST BE FAKED; REFERENCES TO 10-20 & 30-37 ARE CARRIED OUT LITERALLY
                    1150    *
 001073  200702    1160    MPBA1   LAC     INSTR           LOAD THE OFFENDING INSTRUCTION
 001074  500651    1170            AND     $ADRSS          RETAIN JUST THE ADDRESS BITS
 001075  341632    1180            TAD     (-10)
 001076  741100    1190            SPA
 001077  601112    1200            JMP     FAKIT           REFERENCE TO 0-7
 001100  341632    1210            TAD     (-10)
 001101  741100    1220            SPA
 001102  601115    1230            JMP     O.K.            REFERENCE TO 10-17
 001103  341633    1240            TAD     (-20)
 001104  741100    1250            SPA
 001105  601112    1260            JMP     FAKIT           REFERENCE TO 21-37
 001106  341634    1270            TAD     (-BOUNDARY+40)
 001107  751100    1280            SPA!CLA
 001110  601241    1290            JMP     ERR2            THE REFERENCE IS TO 40-BOUNDARY
 001111  601115    1300            JMP     O.K.            THE REFERENCE IS ABOVE THE BOUNDARY
                    1310    *
                    1320    *       CONVERT THE LEGAL PROTECTED MEMORY REFERENCE TO A REFERENCE TO THE USER TABLE
                    1330    *
 001112  201635    1340    FAKIT   LAC     ($.0)
 001113  340702    1350            TAD     INSTR           CONVERT REFERENCE TO POINT TO USER TABLE IMAGE
 001114  040702    1360            DAC     INSTR
                    1370    *
                    1380    *       NOW DO THE USER INSTRUCTION
                    1390    *
    001115          1400    O.K.    ...                     NOTE THE USER MQ, $C, 10, & 11 ARE STILL O.K. AT THIS POINT
                    1410                                    UNLESS ARRIVED AS A PI INTERRUPT. IN THAT CASE 10 & 11
                    1420                                    MAY BE OFF, BUT THE USER'S LOCATION 1 CAN'T LEGALLY BE A
                    1430                                    MEMORY REFERENCE INSTRUCTION, ANYWAY.
                    1440    *
```

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                M                       MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

                      1450    *         SPECIAL CASE OP CODES
                      1460    *
001115  200703        1470    MP12      LAC       OPCOD           RELOAD THE OP CODE
001116  540634        1480              SAD       $BIT0
001117  601155        1490              JMP       .XCT.           VIOLATION WAS AN XCT INSTRUCTION
001120  541636        1500              SAD       (JMS)
001121  601142        1510              JMP       .JMS.           VIOLATION WAS CAUSED BY A JMS INSTRUCTION
001122  541637        1520              SAD       (JMP)
001123  601146        1530              JMP       .JMP.
001124  200000        1540              LAC       0
001125  740010        1550              RAL                       RESTORE THE USER'S LINK FOR THIS OPERATION
001126  200005        1560              LAC       $3AC            AND ALSO HIS AC
001127  400702        1570              XCT       INSTR           EXECUTE THE USER'S INSTRUCTION
001130  741000        1580              SKP                       AVOID INCREMENTING THE RETURN IF THE USER'S INSTRUCTION DID NOT SKIP
001131  440000        1590              INX       0               BUT BUMP THE RETURN IF THE USER'S INSTRUCTION DID SKIP
001132  040005        1600              DAC       $3AC            AND SAVE THE USER'S AC
001133  200000        1610              LAC       0               INITIATE SAVING THE CURRENT USER LINK
001134  500644        1620              AND       $CB0            CLEAR THE OLD LINK
001135  741400        1630              SZL                       IS THE LINK ON?
001136  240634        1640              XOR       $BIT0           YES, SO SAVE IT
001137  040000        1650    MP15      DAC       0               RESAVE THE CURRENT USER RETURN, WITH LINK
001140  101170        1660              JMS       REGRES          RESTORE HIS REGISTERS THAT WON'T GET OTHERWISE RESTORED
001141  600274        1670              RET       $PIDN2
                      1680    *
                      1690    *         SPECIAL MEMORY REFERENCE INSTRUCTIONS
                      1700    *
001142  200000        1710    .JMS,     LAC       0               LOAD THE USER'S PC
001143  501621        1720              AND       (677777)        TURN OFF THE MEMORY PROTECT BIT

001144  060702        1730              DAC       INSTR,X         SET THE USER PC AT THE START OF THE SUBROUTINE
001145  440702        1740              INX       INSTR           AND INCREMENT THE TRANSFER
                      1750
001146  200000        1760    .JMP,     LAC       0               LOAD THE USER'S PC
001147  501626        1770              AND       (700000)        KEEP THE HIGH ORDER BITS OF THE PC
001150  040000        1780              DAC       0
001151  200702        1790              LAC       INSTR
001152  500651        1800              AND       $ADRSS          GET THE NEW USER PC
001153  240000        1810              XOR       0               COMBINE IT WITH THE OLD HIGH-ORDER BITS
001154  601137        1820              JMP       MP15            EXIT
                      1830
001155  200705        1840    .XCT,     LAC       TEMP5           LOAD THE XCT COUNT
001156  750200        1850              SZAICLA
001157  601235        1860              JMP       ERR4            CHAINED XCT'S NOT YET LEGAL
001160  440705        1870    XCT1      INX       TEMP5           NOW COUNT THE XCT
001161  601041        1880              JMP       MP111           AND ITERATE
                      1890
    001162            1900    REGSAVE   ENTER                     SAVE THE REGISTERS THAT HAVEN'T ALREADY BEEN SAVED
                                        .PMC      SAVE,ON
001162  740040                          XX
001163  641002        1910              LACQ                      THE FOLLOWING LOCATIONS MAY ALTER IF THE VIOLATION WAS AN IOT INSTRUCTION
001164  041754        1920              DAC       $MQ
001165  641001        1930              LACS
001166  041755        1940              DAC       $SC
```

```
                M                       MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

001167  621162  1950            RET     REGSAVE,X
                1960
     001170     1970    REGRES  ENTER                   RESTORE THE REGISTERS THAT REGSAVE SAVED
                                .PMC    SAVE,ON
001170  740040                  XX
001171  201755  1980            LAC     $SC             RELOAD THE OLD STEP COUNT
001172  241640  1990            XOR     (77)            COMPLEMENT THE STEP COUNT
001173  341641  2000            TAD     (640402)        DEVELOP A PSEUDO-NORMALIZE INSTRUCTION
001174  501642  2010            AND     (640477)        DELETE POSSIBLE STEP COUNT OVERFLOW
001175  041176  2020            DAC     .+1             PLACE THE NORMALIZE INSTRUCTION IN SEQUENCE
001176  740040  2030            XX                      STEP COUNT TO THE SC
001177  201754  2040            LAC     $MQ             RELOAD THE OLD MQ
001200  652000  2050            LMQ                     AND SET IT
001201  621170  2060            RET     REGRES,X
```

M MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

```
                    2070            .EJECT
                    2080    *
                    2090    *       VIOLATION WAS AN IOT INSTRUCTION -- SEPARATE THE MICROCODING FROM THE REST
                    2100    *
 001202  200702     2110    .IOT,   LAC     INSTR           LOAD THE VIOLATING IOT INSTRUCTION
 001203  501643     2120            AND     ($SPMSK)        RECOVER THE "SPECIAL" BITS
 001204  541644     2130            SAD     ($SPECIAL)      AND CHECK THEM
 001205  601246     2140            JMP     SWAP2           YES -- GET THE SPECIALS HANDLER
 001206  200702     2150            LAC     INSTR           ELSE RELOAD THE VIOLATING IOT INSTRUCTION
 001207  640504     2160            LRS     4               PUT THE MICROCODED BITS IN THE MQ
 001210  040702     2170            DAC     INSTR           SAVE FILL + ALL BUT THE MICROCODED BITS
 001211  641601     2180            EAECLA!LLS 1            RECOVER THE CLEAR AC BIT
 001212  740200     2190            SZA
 001213  140005     2200            DZM     $3AC            ZERO THE USER AC IF THAT BIT WAS SET
                    2210    *
                    2220    *       LOOK UP THE IOT AND BRANCH TO THE PROPER HANDLING ROUTINE
                    2230    *
    001214          2240    IOT0    ...
 001214  140266     2250            DZM     $DKLOK          CLEAR THE DISK-USE FLAG
 001215  761333     2260            LAW     IOTTT-1
 001216  040010     2270            DAC     10              SET UP THE TABLE READ
 001217  220010     2280    IOT1    LAC     10,X            READ THE NEXT TABLE ENTRY
 001220  540702     2290            SAD     INSTR           CHECK AGAINST THE INSTRUCTION IN QUESTION
 001221  601225     2300            JMP     IOT2            MATCHES--BRANCH TO THE HANDLING ROUTINE
 001222  541364     2310            SAD     IOTT9           CHECK FOR THE END OF THE TABLE
 001223  601416     2320            JMP     IOTSW           DONE, AND NO MATCH FOUND
 001224  601217     2330            JMP     IOT1
                    2340
 001225  220010     2350    IOT2    LAC     10,X
 001226  040702     2360            DAC     TEMP2           SET THE TRANSFER
 001227  641002     2370            LACQ
 001230  040703     2380            DAC     TEMP3           SET THE MICROCODE
 001231  742010     2390            RTL
 001232  751100     2400            SPA!CLA                 SKIP IF THERE IS NO IOPS EVENT TIME 1 EVENT
 001233  440702     2410            INX     TEMP2           ELSE BUMP THE ENTRANCE
 001234  601424     2420            JMP     IOT3
                    2430    *
                    2440    *       COMMON ERROR MESSAGES
                    2450    *
 001235  340641     2460    ERR4    TAD     $BIT17          CHAINED XCT'S
 001236  340641     2470    ERR3    TAD     $BIT17          ILLEGAL INSTRUCTION
 001237  741000     2480            SKP
 001240  440000     2490    ERR1    INX     0               ILLEGAL TRANSFER PC NEEDS TO BE FUDGED TO BE ONE TOO GREAT (LIKE ALL ELSE)
 001241  341645     2500    ERR2    TAD     (2)             BAD ADDRESS
 001242  041706     2510    ERR     DAC     $UTEM2          SET THE ERROR MESSAGE NUMBER
 001243  101170     2520            JMS     REGRES          FIX UP THE USER REGISTERS BEFORE TRANSFERRING OUT OF THIS ROUTINE
 001244  761004     2530    SWAP1   LAW     $SWERR
 001245  600335     2540            JMP     $SWAP           GET THE SWAPPER -- ERROR MESSAGE ENTRY POINT
 001246  101170     2550    SWAP2   JMS     REGRES          FIX UP THE USER REGISTERS BEFORE TRANSFERRING OUT OF THIS ROUTINE
 001247  761005     2560            LAW     $SWSPL
 001250  600335     2570            JMP     $SWAP           GO READ IN THE MONITOR/MESSAGE PHANTOM PROGRAM
                    2580
```

M MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

```
                    2590
                    2600
    001251          2610    OAC     ENTER                   INCLUSIVE OR AC WITH USER AC FOR IOT'S
                                    .PMC    SAVE,ON
001251  740040                      XX
001252  040002      2620            DAC     $3TM21
001253  740001      2630            CMA
001254  500005      2640            AND     $3AC
001255  240002      2650            XOR     $3TM21
001256  040005      2660            DAC     $3AC
001257  621251      2670            RET     OAC,X
                    2680
                    2690
    001260          2700    TIM3    ENTER                   DETERMINE WHETHER OR NOT THERE IS AN IOPS EVENT TIME 3 EVENT REQUESTED
                                    .PMC    SAVE,ON
001260  740040                      XX
001261  200703      2710            LAC     TEMP3
001262  751100      2720            SPAICLA
001263  621260      2730            RET     TIM3,X          YES -- GO DO IT
001264  601431      2740            JMP     MEMD1           EXIT
                    2750
                    2760    *
                    2770    *       RDBLK LOOKS FIRST AT THE USER DUE TO RUN NEXT, IF HE IS I/O ROADBLOCKED, THE
                    2780    *       FOLLOWING USER IS EXAMINED, THIS PROCESS IS REPEATED UNTIL SOME USER IS FOUND
                    2790    *       WHO IS FREE TO RUN. NOTE THAT THE ROUTINE, ONCE ENTERED, WILL LOOP INDEFINITELY
                    2800    *       UNTIL A FREE USER IS FOUND.
                    2810    *
                    2820    *       WHEN A FREE USER IS FOUND, THE RETURN IS IMMEDIATE WITH HIS RE-ENTRANT
                    2830    *       TEMPORARY STORAGE SET UP.
                    2840    *
                    2850    *       RDBLK ENABLES THE INTERRUPT SYSTEM TO PERMIT TELETYPE I/O TO
                    2860    *       GO ON WHILE CHECKING FOR ROADBLOCKS, OTHERWISE A TELETYPE
                    2870    *       I/O ROADBLOCK COULD NEVER BE RELIEVED, THIS MEANS THAT BEFORE
                    2880    *       ENABLING INTERRUPTS, THE CALLER'S SAVED AC, 10, & 11 MUST BE
                    2890    *       COPIED, AND RECOPIED BEFORE EXIT.
                    2900    *
                    2910    *       THIS ROUTINE RUNS WITH THE CLOCK OFF TO PREVENT RE-ENTRANCE
                    2920    *       AT A TIME WHEN IT WOULD CRASH THE SYSTEM, ALSO NO ONE IS RUNNING
                    2930    *       AS LONG AS WE ARE HUNG IN THIS LOOP, SO NOTHING IS LOST,
                    2940    *
    001265          2950    RDBLK   ENTER
                                    .PMC    SAVE,ON
001265  740040                      XX
001266  700004      2960            CLOF
001267  200000      2970            LAC     0
001270  040702      2980            DAC     TEMP2           SAVE THE RETURN
001271  200005      2990            LAC     $3AC
001272  040703      3000            DAC     TEMP3           THE SAVED AC
001273  200026      3010            LAC     $,310
001274  040010      3020            DAC     10              THE SAVED AUTO-INDEX REGISTER 10
001275  200027      3030            LAC     $,311
001276  040011      3040            DAC     11              THE SAVED AUTO-INDEX REGISTER 11
```

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                M                       MEMORY PROTECT ROUTINES COMMON TO BOTH OVERLAYS

001277  700042  3050            ION
001300  201771  3060            LAC     $NUMBR          SEE WHO IS RUNNING, IF ANYONE
001301  540104  3070            SAD     $CTNAM
001302  601310  3080            JMP     RDBK2           #1 IS NOW RUNNING -- SO GIVE #2 A CHANCE
001303  540133  3090            SAD     $L1NAM
001304  601313  3100            JMP     RDBK3           #2 IS NOW RUNNING -- SO GIVE #3 A CHANCE
                3110
001305  200102  3120    RDBK1   LAC     $CTFLG          LOAD USER #0 I/O FLAGS
001306  101317  3130            JMS     RDBK5           SEE IF USER #0 IS I/O ROADBLOCKED
001307  760076  3140            LAW     $CTBIN-2        LOAD A POINTER TO USER #0 PARAMETERS
001310  200131  3150    RDBK2   LAC     $L1FLG
001311  101317  3160            JMS     RDBK5           SEE IF USER #1 IS I/O ROADBLOCKED
001312  760125  3170            LAW     $L1BIN-2
001313  200160  3180    RDBK3   LAC     $L2FLG
001314  101317  3190            JMS     RDBK5           SEE IF USER #2 IS I/O ROADBLOCKED
001315  760154  3200            LAW     $L2BIN-2
001316  601305  3210            JMP     RDBK1           LOOP
                3220
                3230    *       SEE IF THE SPECIFIED USER IS I/O ROADBLOCKED, IF SO, RETURN TO THE
                3240    *       ROADBLOCK ROUTINE FOR ANOTHER TRY, IF NOT, EXIT WITH HIS TEMPS SET UP.
                3250
    001317      3260    RDBK5   ENTER
                                ,PMC    SAVE,ON
001317  740040                    XX
001320  742010  3270            RTL                     TELEPRINTER FLAG TO LINK; KEYBOARD FLAG TO AC(0)
001321  741500  3280            SZL!SPA                 SKIP IF THERE IS NO I/O ROADBLOCK
001322  621317  3290            RET     RDBK5,X         ELSE TRY THE NEXT ONE
                3300    *
                3310    *       A NON-ROADBLOCKED USER HAS BEEN FOUND, TURN OFF THE INTERRUPT
                3320    *       SYSTEM, SET UP HIS RE-ENTRANT PARAMETERS AND EXIT.
                3330    *       NOTE THAT AUTO-INDEX REGISTERS 10 & 11 ARE ALREADY CORRECT
                3340    *       SO ONLY THE AC AND THE RESTART ADDRESS NEED TO BE RESTORED.
                3350    *
001323  700002  3360            IOF                     TURN OFF THE INTERRUPT SYSTEM
001324  200702  3370            LAC     TEMP2
001325  040000  3380            DAC     0               RESTORE THE SAVED RETURN
001326  200703  3390            LAC     TEMP3
001327  040005  3400            DAC     $3AC            AND THE SAVED AC
001330  421317  3410            XCT     RDBK5,X         LOAD THE POINTER TO HIS PARAMETERS
001331  100513  3420            JMS     $IO.IN          AND GO SET THEM UP
                3430    *
                3440    *       NOW WE ARE EVIDENTLY READY TO RUN SOMEONE AGAIN, SO TURN IT
                3450    *       BACK ON.
                3460    *
001332  700044  3470            CLON
001333  621265  3480            RET     RDBLK,X         DONE
                3490            .END
```

```
M                                   PROTECTION OVERLAY #2

                    120             .STITL  PROTECTION OVERLAY #2
                    130     *
                    140     *       IOT INSTRUCTION TRANSFER TABLE
                    150     *
    001334          160     IOTTT   ...                     IOT INSTRUCTION TRANSFER TABLE
001334  774340      170             774340                  707000
001335  601425      180             JMP     .DSSF           DSSF
001336  774341      190             774341                  707020
001337  601433      200             JMP     DSK1            DSCC!DRAL!DLAL
001340  774342      210             774342                  707040
001341  601444      220             JMP     DSK2            DSCF!DSFX!BSCN
001342  774343      230             774343                  707060
001343  601431      240             RET     MEMD1           DRAH!DLAH -- NEITHER WAS ANY LEGAL EFFECT, SO IGNORE THEM
001344  774352      250             774352                  707240
001345  601504      260             JMP     .DSCD           DSCD
001346  774353      270             774353                  707260
001347  601511      280             JMP     .DSRS           DSRS
001350  774004      290             774004                  700100
001351  601534      300             JMP     PTR1            RSF!RCF!RSA!RRB
001352  774006      310             774006                  700140
001353  601552      320             JMP     .RSB            RSB
001354  774010      330             774010                  700200
001355  601563      340             JMP     PTP1            PSF!PCF!PSA
001356  774012      350             774012                  700240
001357  601600      360             JMP     .PSB            PSB
001360  774000      370             774000                  700000
001361  601516      380             JMP     .OFF            IOF!CLSF!CLOF
001362  774156      390             774156                  703340
001363  601526      400             JMP     BRK             SKP7!DBR
001364  001000      410     IOTT9   1000                    END FLAG
                    420     *
                    430     *       ILLEGAL OPERATE INSTRUCTIONS HAVE EITHER THE HALT BIT (BIT 12) OR THE
                    440     *       OAS BIT (BIT 15) ON IF THEY TRAPPED THEMSELVES. IF THE TRAP WAS AN XCT (OPR)
                    450     *       IT IS POSSIBLE NEITHER ONE IS ON.
                    460     *
    001365          470     .OPR,   ...
001365  140266      480             DZM     $DKLOK          CLEAR THE DISK USE FLAG
001366  200702      490             LAC     INSTR           LOAD THE ILLEGAL INSTRUCTION
001367  501646      500             AND     (40)
001370  750200      510             SZA!CLA                 SKIP IF THE HALT BIT IS NOT SET
001371  601617      520             JMP     ERR5            GIVE THE USER HIS HALT MESSAGE
001372  200702      530             LAC     INSTR           RELOAD THE INSTRUCTION
001373  501647      540             AND     (100004)        RECOVER THE CLA AND OAC BITS
001374  746010      550             CLL!RTL
001375  740010      560             RAL                     MOVE THE CLA BIT TO THE LINK
001376  741200      570             SNA                     SKIP IF THE OAC BIT WAS SET
001377  601115      580             JMP     O.K.            ELSE DO THE USER'S OPERATE INSTRUCTION
001400  741400      590             SZL                     SKIP UNLESS CLA BIT WAS SET
001401  140005      600             DZM     $3AC            IN WHICH CASE CLEAR THE ACCUMULATOR
001402  201771      610             LAC     $NUMBR          LOAD THIS USER NUMBER
001403  540034      620             SAD     $RACS           SEE IF THIS USER WAS ALLOCATED THE ACCUMULATOR SWITCHES
001404  741000      630             SKP                     YES
```

```
                M                       PROTECTION OVERLAY #2

 001405  601410  640            JMP     .OPR2           NO -- USE THE SOFTWARE VALUE
 001406  750004  650            LAS                     YES -- USE THE HARDWARE SWITCH VALUE
 001407  741000  660            SKP
 001410  201756  670    .OPR2   LAC     $ACS            LOAD THE SOFTWARE ACCUMULATOR SWITCHES VALUE
 001411  101251  680            JMS     OAC             OR WHICHEVER VALUE IT IS INTO THE USER'S AC
 001412  200702  690            LAC     INSTR           RELOAD THE INSTRUCTION
 001413  501650  700            AND     (377773)        REMOVE THE OAS AND CLA BITS, SINCE THEY ARE DONE
 001414  040702  710            DAC     INSTR           RESET THE INSTRUCTION
 001415  601115  720            JMP     O.K.            DO ANY REMAINING OPERATE INSTRUCTION
                 730    *
                 740    *
                 750    *       ROUTINE TO CALL THE NEXT MEMORY PROTECTION OVERLAY UNLESS IT HAS
                 760    *       ALREADY HAD ITS CHANCE AT THE VIOLATION
                 770    *
    001416       780    IOTSW   ...,
 001416  200704  790            LAC     TEMP4           LOAD THE OVERLAY COUNT
 001417  750200  800            SZA!CLA                 SKIP UNLESS ALL OVERLAYS HAVE ALREADY HAD A CHANCE
 001420  601236  810            JMP     ERR3            ELSE THIS WAS THE LAST CHANCE -- IT MUST HAVE BEEN AN ILLEGAL INSTRUCTION
 001421  440704  820            INX     TEMP4           COUNT THIS OVERLAY
 001422  761007  830            LAW     $SWMP1          LOAD A POINTER TO THE SWAPPER ENTRANCE FOR NEXT MEMORY PROTECTION OVERLAY
 001423  600335  840            JMP     $SWAP           AND GET IT
                 850    *
                 860    *
                 870    *
 001424  620702  880    IOT3    JMP     TEMP2,X         GOTO THE PROPER SERVICE ROUTINE
                 890    *
                 900    *       DISK IOT INSTRUCTIONS
                 910    *
 001425  601431  920    .DSSF   RET     MEMD1           THERE IS NO IOPS EVENT TIME 2 OR 3 INSTRUCTION
 001426  201761  930            LAC     $DFLAG
 001427  740200  940            SZA
 001430  440000  950            INX     0               BUMP THE RETURN IF THE SOFTWARE FLAG WAS SET
 001431  101170  960    MEMD1   JMS     REGRES          RESTORE THE REGISTERS NOT OTHERWISE RESTORED
 001432  600270  970            RET     $PIDON
                 980
 001433  740000  990    DSK1    NOP                     NO IOPS EVENT TIME 1
 001434  740400  1000   .DSCC   SNL                     DSCC IS DONE ANYWAY, SO IGNORE IT & PROCEDE
 001435  601440  1010           JMP     DSK12           NO IOPS EVENT TIME 2 EVENT
 001436  201762  1020   .DRAL   LAC     $DAP0

 001437  101251  1030           JMS     OAC
 001440  101260  1040   DSK12   JMS     TIM3            RETURN ONLY IF THERE IS AN IOPS EVENT TIME 3 EVENT
 001441  200005  1050   .DLAL   LAC     $3AC
 001442  041762  1060           DAC     $DAP0
 001443  601431  1070           RET     MEMD1
                 1080
 001444  741000  1090   DSK2    SKP                     NO IOPS EVENT TIME 1 EVENT
 001445  141764  1100   .DSCF   DZM     $DFN
 001446  740400  1110           SNL
 001447  601453  1120           JMP     .+4
 001450  200005  1130   .DSFX   LAC     $3AC
 001451  241764  1140           XOR     $DFN
 001452  041764  1150           DAC     $DFN
```

M PROTECTION OVERLAY #2

```
001453  101260  1160          JMS     TIM3
001454  201762  1170  .DSCN   LAC     $DAP0
001455  707024  1180          DLAL                    SET UP AP0 CORRECTLY FOR THE USER
001456  777777  1190          LAW     -1
001457  340651  1200          TAD     $ADRSS
001460  740001  1210          CMA                     YIELDS MINUS THE HIGHEST LEGAL CORE ADDRESS TO START THE TRANSFER
001461  341751  1220          TAD     $,0+$DKWC
001462  341752  1230          TAD     $,0+$DKCA
001463  750100  1240          SMA!CLA                 SKIP IF THE START ADDRESS IS LEGAL FOR THIS LENGTH TRANSFER
001464  601615  1250          JMP     ERR7            ELSE ANNOUNCE EXCESSIVE WORD COUNT
001465  776001  1260          LAW     -BOUNDARY+1
001466  341752  1270          TAD     $,0+$DKCA
001467  751100  1280          SPA!CLA                 SKIP IF NOT TRYING TO START THE TRANSFER BELOW THE BOUNDARY
001470  601614  1290          JMP     ERR8            ELSE ANNOUNCE BAD CORE ADDRESS
001471  140266  1300          DZM     $DKLOK
001472  440266  1310          INX     $DKLOK          FLAG USER USING DISK
001473  201751  1320          LAC     $,0+$DKWC
001474  040036  1330          DAC     $DKWC           SET UP THE REAL WORD COUNT
001475  201752  1340          LAC     $,0+$DKCA
001476  040037  1350          DAC     $DKCA           SET UP THE REAL CORE ADDRESS
001477  201764  1360          LAC     $DFN
001500  501651  1370          AND     (6)
001501  240641  1380          XOR     $BIT17          FORCE AN INTERRUPTING COMMAND
001502  707047  1390          DSCF!DSFX!DSCN
001503  601431  1400          RET     MEMD1
                1410
001504  740400  1420  .DSCD   SNL                     NO IOPS EVENT TIME 1 EVENT
001505  601431  1430          RET     MEMD1           EXIT UNLESS AN EVENT 2 IS PRESENT -- 1 AND 3 DON'T EXIST
001506  141761  1440          DZM     $DFLAG
001507  141765  1450          DZM     $DSTAT
001510  601431  1460          RET     MEMD1
                1470
001511  740400  1480  .DSRS   SNL                     NO IOPS EVENT TIME 1 EVENT
001512  601431  1490          RET     MEMD1           EXIT UNLESS EVENT 2 -- 1 AND 3 DON'T EXIST
001513  201765  1500          LAC     $DSTAT
001514  101251  1510          JMS     OAC
001515  601431  1520          RET     MEMD1
                1530
                1540
                1550
001516  740400  1560  .OFF    SNL                     SKIP ONLY IF THERE IS AN EVENT TIME 2 EVENT (IOF)
001517  601236  1570  .CLSF   JMP     ERR3            CLOCK NOT YET ENABLED
001520  201760  1580  .IOF    LAC     $IORS           LOAD USER IORS WORD
001521  740010  1590          RAL
001522  744020  1600          CLL!RAR
001523  041760  1610          DAC     $IORS           RESTORE IORS WORD WITH PI FLAG SOFF
001524  101260  1620  .OFF2   JMS     TIM3            RETURN IF THERE IS AN IOPS TIME 3 EVENT
001525  601236  1630  .CLOF   JMP     ERR3            CLOCK NOT YET ENABLED
                1640
                1650
                1660
001526  741000  1670  BRK     SKP
```

```
                M                                PROTECTION OVERLAY #2

001527  440000  1680            INX     0               'SKP7' -- SKIP IF NOT A PDP4
001530  101260  1690            JMS     TIM3            RETURN IF THERE IS AN IOPS EVENT TIME 3 EVENT
001531  201652  1700    .DBR    LAC     (DBR)
001532  040303  1710            DAC     $PIOUT
001533  601431  1720            RET     MEMD1
                1730
                1740
001534  601541  1750    PTR1    JMP     PTR11           NO IOPS EVENT TIME 1
001535  101555  1760    .RSF    JMS     RDRP            CHECK FOR READER PERMISSION
001536  200234  1770            LAC     $RFLAG
001537  740200  1780            SZA
001540  440000  1790            INX     0               BUMP THE RETURN IF THE FLAG WAS SET
001541  101555  1800    PTR11   JMS     RDRP            CHECK FOR READER PERMISSION
001542  740400  1810            SNL
001543  601547  1820            JMP     PTR12           NO IOPS EVENT TIME 2
001544  140234  1830    .RCF    DZM     $RFLAG
001545  700112  1840            RRB
001546  101251  1850            JMS     OAC             UPDATE THE USER AC
001547  101260  1860    PTR12   JMS     TIM3            RETURN IF THERE IS AN IOPS TIME 3 EVENT
001550  700104  1870    .RSA    RSA
001551  601431  1880            RET     MEMD1
                1890
001552  101555  1900    .RSB    JMS     RDRP            CHECK FOR READER PERMISSION
001553  700144  1910            RSB
001554  601431  1920            RET     MEMD1
                1930
001555          1940    RDRP    ENTER                   CHECK FOR PERFORATED TAPE READER PERMISSION
                                .PMC    SAVE,ON
001555  740040                  XX
001556  200235  1950            LAC     $RPTR
001557  541771  1960            SAD     $NUMBR
001560  621555  1970            RET     RDRP,X
001561  760011  1980            LAW     9,
001562  601242  1990            JMP     ERR
                2000
                2010
                2020
001563  601570  2030    PTP1    JMP     PTP11           NO IOPS EVENT TIME 1
001564  101605  2040    .PSF    JMS     PTPP            CHECK FOR PUNCH PERMISSION
001565  200227  2050            LAC     $PFLAG
001566  740200  2060            SZA
001567  440000  2070            INX     0               BUMP THE RETURN IF THE FLAG WAS SET
001570  101605  2080    PTP11   JMS     PTPP            CHECK FOR PUNCH PERMISSION
001571  741400  2090            SZL
001572  140227  2100    .PCF    DZM     $PFLAG
001573  101260  2110            JMS     TIM3            RETURN IF THERE IS AN IOPS TIME 3 EVENT
001574  200005  2120    .PSA    LAC     $3AC
001575  700204  2130            PSA
001576  140227  2140            DZM     $PFLAG          CLEAR THE SOFTWARE FLAG
001577  601431  2150            RET     MEMD1
                2160
001600  101605  2170    .PSB    JMS     PTPP            CHECK FOR PUNCH PERMISSION
```

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            M                           PROTECTION OVERLAY #2

001601  200005  2180          LAC     $3AC
001602  700244  2190          PSB
001603  140227  2200          DZM     $PFLAG          CLEAR THE SOFTWARE FLAG
001604  601431  2210          RET     MEMD1
                2220
    001605      2230  PTPP    ENTER                   CHECK FOR PAPER TAPE PERMISSION
                              ,PMC    SAVE,ON
001605  740040                XX
001606  200230  2240          LAC     $RPTP
001607  541771  2250          SAD     $NUMBR
001610  621605  2260          RET     PTPP,X
001611  760011  2270          LAW     9.
001612  601242  2280          JMP     ERR
                2290
001613  340641  2300  ERR9    TAD     $BIT17          UNASSIGNED DEVICE REQUESTED
001614  340641  2310  ERR8    TAD     $BIT17          ATTEMPTED DISK/DECTAPE TRANSFER TO/FROM PROTECTED MEMORY
001615  340641  2320  ERR7    TAD     $BIT17          EXCESSIVE WORD COUNT FOR DISK/DECTAPE TRANSFER
001616  340641  2330  ERR6    TAD     $BIT17          DISK OVERFLOW ATTEMPTED
001617  340641  2340  ERR5    TAD     $BIT17          HALTED PROGRAM
001620  601235  2350          JMP     ERR4            CARRY ON
001621  677777  2360          .END    OVSTRT
001622  100001
001623  776000
001624  740000
001625  640000
001626  700000
001627  020000
001630  017770
001631  000010
001632  777770
001633  777760
001634  776040
001635  001713
001636  100000
001637  600000
001640  000077
001641  640402
001642  640477
001643  777400
001644  705000
001645  000002
001646  000040
001647  100004
001650  377773
001651  000006
001652  703344

TRANSFER ADDRESS  601000
```

M CROSS REFERENCE TABLE

1713	.0	4510	4520	480	520	1340	1220	1230	1270	1320	1340		
26	.310	3400	3010										
27	.311	3410	3030										
4464	.DT	570											
6460	.TP	550											
2023	10SAVE	1870	1880										
2024	11SAVE	1880	1920										
5	3AC	3370	1560	1600	2200	2640	2660	2990	3400	600	1050	1130	2120	2180
305	3REST	3870	3880										
51	3TEM0	3530	3540										
52	3TEM1	3540	3550										
53	3TEM2	3550	3560										
54	3TEM3	3560	3570										
55	3TEM4	3570	3580										
56	3TEM5	3580	3590										
57	3TEM6	3590	3600										
50	3TM20	3520	3530										
2	3TM21	3350	2620	2650									
3	3TM22	3360											
14000	7K	1030											
16000	8K	1020	910	1010	2640	2650							
1753	AC	4520	4530										
1756	ACS	4550	4560	670									
2015	ACSAVE	1810	1820										
2022	ACSW	1860	1870										
651	ADRSS	4100	4110	670	1070	1170	1800	1200					
300	AT	2950											
390	ATSGN	2900											
422030	BAS	420											
2151	BCNTRL	2330	2340										
634	BIT0	3970	3980	490	1480	1640							
641	BIT17	4020	4030	2460	2470	1380	2380	2310	2320	2330	2340		
635	BIT35	3980	3990										
636	BIT5	3990	4000										
637	BIT6	4000	4010										
640	BIT7	4010	4020										
642	BL7	4030	4040										
643	BL8	4040	4050										
2000	BOUNDA	970	960	980	990	1000	1630	5040	5080	680	1270	1260	
377	BRK	5550											
2170	BUFFER	2490	2550										
1090	BUFLEN	2500	2550										
644	CB0	4050	4060	1620									
645	CB1	4060	4070										
646	CB5	4070	4080										
647	CB7	4080	4090										
650	CBL8	4090	4100										
6	CHRMAX	3180	3200										
2	CHRPAK	3130	3200										
50	CLKMAX	2840	3180										
60	CLKSPD	3160	3170										
1757	CLOCK	4560	4570										

M CROSS REFERENCE TABLE

45	CMP1	3490	3500				
46	CMP2	3500	3510				
6	CNTRL	3380	3390				
2053	COMFLG	2200	2210				
2150	COMSTO	2270	2280				
16000	CORMAX	910	980				
47	CSPL	3510	3520				
44	CSWP	3480	3490				
60	CTBFR	3600	3630	3640			
100	CTBIN	3640	3650	3670	4250	3140	
2000	CTEMP0	1630					
2001	CTEMP1	1640					
2002	CTEMP2	1650					
2003	CTEMP3	1660					
2004	CTEMP4	1670					
2005	CTEMP5	1680					
2006	CTEMP6	1690					
2007	CTEMP7	1700					
2010	CTEMP8	1710					
2011	CTEMP9	1720					
102	CTFLG	3650	3660	3120			
104	CTNAM	3660	3070				
2043	D PC	2120	2130				
2154	D BCA	2370	2380				
2153	D BDA	2360	2370				
2163	D FDA	2440	2450				
2042	D LOC	2110	2120				
2022	D ACSW	1860					
2156	D BALT	2390	2400				
2155	D BLEN	2380	2390				
2161	D BMAX	2420	2430				
2157	D BMIN	2400	2410				
2162	D BPTR	2430	2440				
2167	D FMAX	2480	2490				
2165	D FMIN	2460	2470				
2046	D MASK	2150	2160				
2164	D MFDA	2450	2460				
2036	DADRSW	2070	2080				
1762	DAP0	4590	4600	1020	1060	1170	
1763	DAP1	4600	4610				
653	DBK	4120	4130				
24	DBKNUM	2220	2270				
2054	DBKTAB	2210	2270				
2035	DBSTOR	2050	2060				
422027	DDT	410					
12000	DDT$T	5000					
2037	DDUMSW	2080	2090				
1761	DFLAG	4580	4590	930	1440		
1764	DFN	4610	4620	1100	1140	1150	1360
2151	DFTYPE	2340	2350				
2045	DHICOR	2140	2150				
2050	DINDIR	2170	2180				

M CROSS REFERENCE TABLE

100	DK0	4270					
127	DK1	4310					
156	DK2	4350					
37	DKCA	2750	1230	1270	1340	1350	
675	DKDON	4170	4180				
16090	DKLEN	2650	2660				
34	DKLENB	2660					
266	DKLOK	3830	3840	2250	480	1300	1310
672	DKOVR	4160	4170				
2	DKRD	2760					
36	DKWC	2740	1220	1320	1330		
4	DKWRT	2770					
2041	DLIMIT	2100	2110				
2084	DLOCOR	2130	2140				
2160	DMBMIN	2410	2420				
2166	DMFMIN	2470	2480				
654	DO	4130	4140				
662	DO2	4140	4150				
663	DO3	4150	4160				
2152	DOFTYP	2350	2360				
2032	DPACSW	1980					
2040	DPATSW	2090	2100				
2051	DPCMSK	2180	2190				
2052	DREGBR	2190	2200				
2035	DREGSW	2060	2070				
2047	DRELOC	2160	2170				
1765	DSTAT	4620	4630	1450	1500		
446490	DT.	560					
2090	DTEMP0	1630					
2091	DTEMP1	1640					
2092	DTEMP2	1650					
2093	DTEMP3	1660					
2094	DTEMP4	1670					
2095	DTEMP5	1680					
2096	DTEMP6	1690					
2097	DTEMP7	1700					
2010	DTEMP8	1710					
2011	DTEMP9	1720					
275	EQUAL	2910					
602	FGET	3950	3960				
1701	FRCA	4410	4420				
1700	FRDA	4400	4410				
1702	FRLEN	4420	4430				
1703	FRSTA	4430	4440				
2	FUDGE	3190	3200				
276	GREAT	2930					
1790	IMPLEN	990					
3170	IMPSTR	2550					
422020	INT	320					
513	IO.IN	3910	3920	3420			
525	IO.OT	3920	3930	400			
300000	IOBLK	2830					

M CROSS REFERENCE TABLE

1760	IORS	4570	4580	410	450	1580	1610	
1002	IOTO	4900	4910					
652	JMP	4110	4120					
100	JTLEN	960						
1700	JTSTRT	950	940	960	1000	4400		
16	KBLEN	3610	3630	3640	3680	3690	3730	3740
10	KBNUM	3620	3670	3720				
76	LOLOK	3630						
107	L1BFR	3670	3680	3690				
127	L1BIN	3690	3700	3720	4290	3170		
131	L1FLG	3700	3710	3150				
125	L1LOK	3680						
133	L1NAM	3710	3090					
136	L2BFR	3720	3730	3740				
156	L2BIN	3740	3750	4330	3200			
160	L2FLG	3750	3760	3180				
154	L2LOK	3730						
162	L2NAM	3760	3770					
422026	LDR	390						
2000	LDRST	5040						
274	LESS	2920						
1526	M BRK	1670	400					
1282	M ERR	2510	1990	2280				
1251	M OAC	2610	2670	680	1030	1510	1850	
1531	M .DBR	1700						
1520	M .IOF	1580						
1516	M .OFF	1560	380					
1572	M .PCF	2100						
1574	M .PSA	2120						
1600	M .PSB	2170	360					
1564	M .PSF	2040						
1514	M .RCF	1830						
1550	M .RSA	1870						
1552	M .RSB	1900	320					
1535	M .RSF	1760						
2022	M ACSW	1860						
1433	M DSK1	990	200					
1444	M DSK2	1090	220					
1240	M ERR1	2490	700					
1241	M ERR2	2500	1290					
1236	M ERR3	2470	820	810	1570	1630		
1235	M ERR4	2460	1860	2350				
1617	M ERR5	2340	520					
1616	M ERR6	2330						
1615	M ERR7	2320	1250					
1614	M ERR8	2310	1290					
1613	M ERR9	2300						
1214	M IOTO	2240	310					
1217	M IOT1	2280	2330					
1225	M IOT2	2350	2300					
1424	M IOT3	880	2420					
1115	M MP12	1470						

M CROSS REFERENCE TABLE

1137	M MP15	1650	1820										
1027	M MPST	590	290										
1115	M O,K,	1400	880	1230	1300	580	720						
1007	M PINT	400	300										
1563	M PTP1	2030	340										
1605	M PTPP	2230	2040	2080	2170	2260							
1534	M PTR1	1750	300										
1555	M RDRP	1940	1760	1800	1900	1970							
1260	M TIM3	2700	2730	1040	1160	1620	1690	1860	2110				
1160	M XCT1	1870											
1525	M,CLOF	1630											
1517	M,CLSF	1570											
1441	M,DLAL	1050											
1436	M,DRAL	1020											
1434	M,DSCC	1000											
1504	M,DSCD	1420	260										
1445	M,DSCF	1100											
1454	M,DSCN	1170											
1450	M,DSFX	1130											
1511	M,DSRS	1480	280										
1425	M,DSSF	920	180										
1202	M,IOT,	2110	920										
1146	M,JMP,	1760	1530										
1142	M,JMS,	1710	1510										
1524	M,OFF2	1620											
1365	M,OPR,	470	330	900									
1410	M,OPR2	670	640										
1155	M,XCT,	1840	1490										
1440	MDSK12	1040	1010										
1112	MFAKIT	1340	1200	1260									
10	MINBUF	3200	3610										
702	MINSTR	230	760	770	780	970	1010	1040	1060	1090	1160	1350	1360	1570
			1730	1740	1790	2110	2150	2170	2290	490	530	690	710	
1416	MIOTSW	780	2320										
1364	MIOTT9	410	2310										
1334	MIOTTT	160	2260										
1431	MMEMD1	960	2740	240	920	1070	1480	1430	1460	1490	1520	1720	1880	1920
			2150	2210										
1041	MMP111	770	550	1880										
1073	MMPBA1	1160	1000											
703	MOPCOD	250	830	1080	1470									
1053	MOPRST	900												
422023	MP1	350												
422024	MP2	360												
2032	MPACSW	1980												
1095	MPINST	340	790											
1094	MPOPR	4920												
1090	MPST	4880	4890											
1080	MPSTRT	290												
1570	MPTP11	2080	2030											
1541	MPTR11	1800	1750											
1547	MPTR12	1860	1820											

M CROSS REFERENCE TABLE

1754	MQ	4530	4540	1920	2040				
2016	MQSAVE	1820	1830						
1305	MRDBK1	3120	3210						
1310	MRDBK2	3150	3080						
1313	MRDBK3	3180	3100						
1317	MRDBK5	3260	3130	3160	3190	3290	3410		
1265	MRDBLK	2950	320	3480					
1244	MSWAP1	2530							
1246	MSWAP2	2550	2140						
2000	MTEMP0	1630							
2001	MTEMP1	1640							
702	MTEMP2	240	2360	2410	2980	3370	880		
703	MTEMP3	260	2380	2710	3000	3390			
704	MTEMP4	270	530	610	790	820			
705	MTEMP5	280	540	620	1840	1870			
2006	MTEMP6	1690							
2007	MTEMP7	1700							
2010	MTEMP8	1710							
2011	MTEMP9	1720							
422025	MTR	370							
2000	MTRST	5080							
1772	NAME	4670	4680						
540	NEWBR	3930	3940						
1771	NUMBR	4660	4670	3060	610	1960	2250		
623	NXPTR	3960	3970						
702	OC0	4180	4190	230	240				
703	OC1	4190	4200	250	260				
704	OC2	4200	4210	270					
705	OC3	4210	280						
574646	OFF	2730							
575600	ON	2720							
1773	OVER	4680	4690						
780	OVLEN	940							
1000	OVSTRT	930	920	940	4750	4880	4960	220	2360
2033	P10SAV	1990	2000						
2034	P11SAV	2000	2050						
2025	PACSAV	1930	1940						
2032	PACSW	1980	1990						
241	PBFLAG	3810	3820						
2017	PCSAVE	1830	1840						
227	PFLAG	3770	3780	2050	2100	2140	2280		
77	PH0	4260	4270						
126	PH1	4300	4310						
155	PH2	4340	4350						
1	PHANTO	2780							
2150	PHFLAG	2280	2330						
1700	PHLEN	2640							
2025	PHSTOR	1920	1930						
274	PIDN2	3850	3860	1670					
270	PIDON	3840	3850	430	970				
1001	PINT	4890	4900						
303	PIOUT	3860	3870	1710					

M CROSS REFERENCE TABLE

```
602026  PLDR        400
  2026  PMQSAV     1940    1950
602025  PMTR        380
  2027  PPCSAV     1950    1960
606064  PPT         520
  2031  PSCSAV     1970    1980
  2030  PSTSAV     1960    1970
606460  PTP         510
606462  PTR         500
 12100  PURLEN     1010
  1775  PURNM      4700    4710
  3700  PURSTR     2560     990    1010    2560
   546  PUTIN      3940    3950
    34  RACS       3440     620
     6  RCNT       3390
    35  RCORE      3450
  1003  RDBLK      4910    4920
    32  RDT0       3420
    33  RDT1       3430
  1170  REGRES     1970    1660    2060    2520    2550     960
  1162  REGSAV     1900     390     600    1950
422021  RES         330
    40  RESCAT     3470    3480
  1000  RESLEN      920
   234  RFLAG      3790    3800    1770    1830
   230  RPTP       3780    3790    2240
   235  RPTR       3800    3810    1950
   242  RSCO       3820    3830
  1776  RSTRT      4710
  1755  SC         4540    4550    1940    1980
640000  SCRSTR     2670
  2021  SCSAVE     1850    1860
   243  SHARP      2890
   377  SPCOD      5410
422122  SPL         430
  1000  SPLST      4960
777400  SPMSK      5390    2120
  2020  STSAVE     1840    1850
   335  SWAP       3880    3890    2540    2570     840
   336  SWAP1      3890    3900
   340  SWAP3      3900    3910
  1000  SWCAT      4750    4760
  1003  SWCLK      4780    4790
  1004  SWERR      4790    4800    2530
  1007  SWMP1      4820    4830     830
  1010  SWMP2      4830    4840
  1002  SWMTR      4770    4780
  1011  SWOPR      4840
422022  SWP         340
  1001  SWPPR      4760    4770
    40  SWPS       3460    3470
  1005  SWSPL      4800    4810    2560
```

M CROSS REFERENCE TABLE

1006	SXSPL	4810	4820	
1300	SYSBAS	2800	2810	
41300	SYSDA	2810		
1777	SYSMAX	2820		
100	TABLEN	2630	2640	
2000	TEMP0	1630	1640	
2001	TEMP1	1640	1650	
2012	TEMP10	1730	1740	
2013	TEMP11	1740	1750	
2014	TEMP12	1750	1800	
2002	TEMP2	1650	1660	
2003	TEMP3	1660	1670	
2004	TEMP4	1670	1680	
2005	TEMP5	1680	1690	
2006	TEMP6	1690	1700	
2007	TEMP7	1700	1710	
2010	TEMP8	1710	1720	
2011	TEMP9	1720	1730	
646000	TP.	540		
376	TRCOFF	5540		
375	TRCON	5530		
2000	TTEMP0	1630		
2001	TTEMP1	1640		
2002	TTEMP2	1650		
2003	TTEMP3	1660		
2004	TTEMP4	1670		
2005	TTEMP5	1680		
2006	TTEMP6	1690		
2007	TTEMP7	1700		
2010	TTEMP8	1710		
2011	TTEMP9	1720		
6	TTYCLK	3170	3180	
3	TTYNUM	3140		
10	TTYSPD	3150	3170	
1774	TYPE	4690	4700	
1766	UCORE	4630	4640	
1767	UDISK	4640	4650	
336	UPARR	2940		
96	US0	4250	4260	4280
125	US1	4290	4300	4320
154	US2	4330	4340	4360
0	USER	2790		
3	USERS	2850	3200	
14000	USLEN	980	2640	
2015	USTORE	1800	1810	
75	UT0	4280		
124	UT1	4320		
153	UT2	4360		
1704	UTEM0	4440	4450	
1705	UTEM1	4450	4460	
1706	UTEM2	4460	4470	2510
1707	UTEM3	4470	4480	

M CROSS REFERENCE TABLE

1710	UTEM4	4480	4490
1711	UTEM5	4490	4500
1712	UTEM6	4500	4510
1770	VALID	4650	4660

M

UNDEFINED SYMBOLS

#1	5630											
#2	5640											
#3	5650											
#4	5660											
#5	5680											
DEFINS	100	100	120	120	580	580	2680	2680	3210	3210	5330	5330
M #1	190											
PURCOD	5140	5270										

M MACRO CROSS REFERENCE TABLE

ENTER	5280	1900	1970	2610	2700	2950	3260	1940	2230
MPOFF	5430								
SWAP	5610								
TABLE	170								