KT11-D

MTPI/MFPI WITH MEM MGT

MD-11-DBKTC-B

EP-DBKTC-B-DL-A

FICHE 1 OF 1

APR 1977

digital

MADE IN USA

B01

EOF1DBKTB&SEQ	00010000	770323	PDP10 411	ERHDR1DBKTCBSEQ	00010000	770323

.REM %

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DBKTC-B-D

PRODUCT NAME: MTPI/MFPI WITH MEMORY MANAGEMENT

DATE RELEASED: MARCH, 1977

MAINTAINER: DIAGNOSTIC GROUP

1.0 ABSTRACT

PROGRAM DBKTC TESTS THE MFPI AND MTPI INSTRUCTIONS WITH MEMORY MANAGEMENT ENABLED. THESE INSTRUCTIONS ARE EXECUTED IN ALL COMBINATIONS OF CURRENT MODES AND EQUAL OR LOWER HEIRARCHY PREVIOUS MODES.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/40 WITH KT11-D (MEMORY MANAGEMENT) OPTION INSTALLED

2.2 STORAGE

PROGRAM STORAGE - THE ROUTINE USES MEMORY 0-17777

3.0 LOADING AND STARTING PROCEDURE

LOAD PROGRAM INTC MEMORY USING ABS LOADER
LOAD ADDRESS 200
PRESS START.
THE PROGRAM WILL LOOP AND RING BELL ON COMPLETION.

4.0 SWITCH SETTINGS

5.0 SUBROUTINE ABSTRACTS

5.1 HLT

THE HLT (HALT) INSTRUCTION IS EXECUTED WHEN AN ERROR IS DETECTED. NOTE THAT THE HLT (HALT) INSTRUCTION TRAPS TO LOC 10 IN USER MODE. IF A HLT (HALT) INSTRUCTION IS EXECUTED IN THESE MODES THE TRAP IS TAKEN AND THE PROGRAM RETURNS TO THE HLT IN KERNEL MODE AND HALTS. NOTE: THE USER STACK POINTER IS NOT AFFECTED. FURTHER TESTING SHOULD NOT BE CONTINUED (BY PRESSING CONTINUE). THE TEST SHOULD BE RESTARTED EITHER AT THE PREVIOUS SCOPE OR AT 200.

5.2 SCOPE

THE SCOPE (EMT) SERVICE ROUTINE STORES IN R1 THE PC OF THE LAST TEST SUCCESSFULLY EXECUTED AND MAY BE USED AS AN AID IN DEBUGGING IF THE PROGRAM 'BOMBS' BECAUSE OF A HARDWARE FAILURE. A BRANCH INSTRUCTION MAY BE INSERTED AT THE SCOPE LOCATION TO THE PREVIOUS SCOPE (EMT) INSTRUCTION TO CONTINOUSLY LOOP A TEST. ADDITIONALLY THE SCOPE ROUTINE SETS ALL STACK POINTERS TO THEIR INITIAL SETTINGS (SEE SEC 8.2) AND ENTERS EACH TEST IN KERNEL MODE, PREVIOUS KERNEL MODE. ALL TESTS MAY BE RESTARTED AT THE PREVIOUS SCOPE.

6.0 ERRORS

THE TEST HALTS WHEN AN ERROR IS DETECTED AND DISPLAYS THE PC+2 OF THE HLT (HALT) INSTRUCTION IN THE ADDRESS LIGHTS.

6.1 ERROR RECOVERY

PRESS CONTINUE OR RESTART AT 200 OR PREVIOUS SCOPE.

6.2 ERROR LOOPING

TO LOOP ON AN ERROR REPLACE THE HLT INSTRUCTION WITH A BRANCH BACK TO THE PREVIOUS SCOPE. NOTE: IF THE ERROR IS INTERMITTENT THE TEST WILL DROP THROUGH THE HLT AND CONTINUE TO THE NEXT TEST.

6.3 MEMORY MANAGEMENT ABORT ERRORS

IF AN ABORT OCCURS (EXCEPT WHEN A TEST EXPECTS AN ABORT) THE PROGRAM WILL TRAP. THE TRAP SERVICE ROUTINE SAVES THE CONTENTS OF SR0 IN LOCATION SSR0T, CLEARS SR0, JUMPS TO LOCATION 252 AND HALTS. TO DETERMINE WHICH TEST CAUSED THE ABORT EITHER EXAMINE THE KERNEL STACK OR EXAMINE R1 (R1 CONTAINS THE PC OF THE FIRST INSTRUCTION IN THE TEST).

7.0 RESTRICTIONS

7.1 STARTING RESTRICTION

NONE

7.2 OPERATIONAL RESTRICTION

NONE

8.0 MISCELLANEOUS

IF THE PROGRAM HALTS IN THE TRAP/INTERRUPT VECTOR AREA (0-1000), EXAMINE REGISTER 6 (THE KERNEL STACK PTR). R6 CONTAINS THE ADDRESS WHERE THE PC OF THE INSTRUCTION THAT CAUSED THE TRAP ABORT IS STORED. SEE ALSO R1 (R1 SPECIFIES THE LAST TEST COMPLETED).

8.1 NOTE THAT THE PROGRAM TAGS EACH MFPI INSTRUCTION UNDER TEST. THE TAG DENOTES CURRENT SPACE, 'PREVIOUS' SPACE. FOR EXAMPLE:

1) KU14:
2) UU17:

DENOTE:

1) 'CURRENT' KERNEL MODE, 'PREVIOUS' USER MODE
2) 'CURRENT' USER MODE, 'PREVIOUS' USER MODE,

NOTE ALSO THAT MEMORY MANAGEMENT IS ENABLED ONLY WHEN THE MFPI/MTPI INSTRUCTION BEING TESTED IS EXECUTED AND IS OFF AT ALL OTHER TIMES.

8.2 STACK POINTER

THE STACK POINTERS ARE INITIALLY SET TO THE FOLLOWING VALUES
KERNEL =1060
USER = 600

AND ARE RESET TO THESE VALUES AT THE START OF EACH SUBTEST (BY SCOPE).

8.3 PASS COUNT

1000(8) PASSES ARE REQUIRED FOR COMPLETION OF THIS PROGRAM; AT WHICH TIME THE BELL WILL RING AND AN '*' PRINTED AT THE TERMINAL.

8.4 DEBUGGING TIPS

WHEN THE FAILING SUBTEST HAS BEEN ISOLATED, REPLACE THE FIRST WORD OF THE MTPI INSTRUCTION WITH A BR SELF (000777), AND START THE SUBTEST AT THE PREVIOUS SCOPE. STOP THE PROGRAM (SINGLE INSTRUCTION) AND RESTORE THE REPLACED INSTRUCTION; USING THE MAINTENANCE CARD SINGLE STEP THE FAILING INSTRUCTION THROUGH EACH MICRO STATE OBSERVING THE FLOW IN THE DATA/ADDRESS LIGHTS. THIS PRACTICE HAS BEEN FOUND TO BE SUCCESSFUL IN FINDING MOST MEMORY MANAGEMENT ERRORS.

8.5 MEMORY MANAGEMENT MEMORY MAP

THE MAPPING OF THE MEMORY MANAGEMENT REGISTERS IS DONE AT THE BEGINNING OF THE PROGRAM BEFORE ANY TESTING IS STARTED. THE USER SHOULD ACQUAINT HIMSELF WITH THE MEMORY MANAGEMENT MAP BEFORE USING THIS PROGRAM.

%

```
                                ;SEGMENTATION TEST. THIS TEST TESTS THE MTPI & MFPI INSTRUCTIONS.

                                ;GENERAL REGISTER ASSIGNMENTS
000000                                  R0=%0
000001                                  R1=%1
000002                                  R2=%2
000003                                  R3=%3
000004                                  R4=%4
000005                                  R5=%5
000007                                  PC=%7
                                ;STACK POINTER REGISTERS
000006                                  KSP=%6                  ;KERNEL STACK POINTER
000006                                  US.=%6                  ;USER STACK POINTER

                                ;STATUS REGISTER BIT ASSIGNMENTS
000001                                  C=1                     ;CARRY BIT
000004                                  Z=4                     ;ZERO BIT
000010                                  N=10                    ;NEGATIVE BIT
000340                                  PRTY7=340               ;PRIORITY LEVEL 7
000200                                  PRTY4=200               ;PRIORITY LEVEL 4
000000                                  KM=000000               ;KERNEL MODE
140000                                  UM=140000               ;USER MODE
030000                                  PUM=030000              ;PREVIOUS USER MODE

                                ;VECTOR ADDRESSES
000010                                  ERRVEC=10               ;ADDRESS OF ERROR VECTOR
000024                                  PFVEC=24                ;ADDRESS OF POWER FAIL TRAP VECTOR
000030                                  EMTVEC=30               ;ADDRESS OF EMT VECTOR
000250                                  MMVEC=250               ;ADDRESS OF MNGT ERROR TRAP VECTOR

                                ;REGISTER ADDRESSES
177776                                  PSW=177776              ;ADDRESS OF STATUS REGISTER
177774                                  SLR=177774              ;ADDRESS OF STACK LIMIT REGISTER
177560                                  TKS=177560              ;ADDRESS OF KEYBOARD CSR
177562                                  TKB=177562              ;ADDRESS OF KEYBOARD BUFFER
177564                                  TPS=177564              ;ADDRESS OF TELEPRINTER CSR
177566                                  TPB=177566              ;ADDRESS OF TELEPRINTER BUFFER
177570                                  DISPLAY=177570          ;ADDRESS OF CONSOL DISPLAY REGISTER
```

```
                                ;INITIAL STACK POINTER SETTINGS
001060                                  KPTR=1060               ;BOTTOM OF KERNEL STACK
000600                                  UPTR=600                ;USER STACK SETTING
                                ;*****************************NOTE*************************************
                                ;THE KERNEL & USER STACK POINTER ARE AT PHYSICAL 1060 & 0600
                                ;**********************************************************************

                                ;MNGTMENTATION REGISTER ADDRESS ASSIGNMENTS
177572                                  SR0=177572              ;ADDRESS OF SEGMENTATION REGISTER SR0
177574                                  SR1=177574              ;    "    "      "            "   SR1
177576                                  SR2=177576              ;    "    "      "            "   SR2

177600                                  UPDR0=177600            ;USER PDR'S
177602                                  UPDR1=177602
177604                                  UPDR2=177604
177606                                  UPDR3=177606
177610                                  UPDR4=177610
177612                                  UPDR5=177612
177614                                  UPDR6=177614
177616                                  UPDR7=177616

177640                                  UPAR0=177640            ;USER PAR'S
177642                                  UPAR1=177642
177644                                  UPAR2=177644
177646                                  UPAR3=177646
177650                                  UPAR4=177650
177652                                  UPAR5=177652
177654                                  UPAR6=177654
177656                                  UPAR7=177656


172300                                  KPDR0=172300            ;KERNEL PDR'S
172302                                  KPDR1=172302
172304                                  KPDR2=172304
172306                                  KPDR3=172306
172310                                  KPDR4=172310
172312                                  KPDR5=172312
172314                                  KPDR6=172314
172316                                  KPDR7=172316

172340                                  KPAR0=172340            ;KERNEL PAR'S
172342                                  KPAR1=172342
172344                                  KPAR2=172344
172346                                  KPAR3=172346
172350                                  KPAR4=172350
172352                                  KPAR5=172352
172354                                  KPAR6=172354
172356                                  KPAR7=172356
```

```
                                        ;ACCESS CONTROL FIELD DEFINITIONS (IN PDR)
            000006                              RW=6                    ;READ & WRITE

                                        ;INSTUCTION EQUATES
            000000                              HLT=HALT
            104000                              SCOPE=EMT               ;SCOPE IS AN EMT TRAP INST.


            000000                              .=0
000000      000002                              .+2
000002      000000                              HALT
000004      000006                              .+2
000006      000000                              HALT
000010      000012                              .+2
000012      000000                              HALT
000014      000016                              .+2
000016      000000                              HALT
000020      000022                              .+2
000022      000000                              HALT
000024      000026                              .+2
000026      000000                              HALT
000030      000032                              .+2
000032      000000                              HALT
000034      000036                              .+2
000036      000000                              HALT
000040      000042                              .+2
000042      000000                              HALT
000044      000046                              .+2
000046      000000                              HALT
000050      000052                              .+2
000052      000000                              HALT
000054      000056                              .+2
000056      000000                              HALT
000060      000062                              .+2
000062      000000                              HALT
000064      000066                              .+2
000066      000000                              HALT
000070      000072                              .+2
000072      000000                              HALT
000074      000076                              .+2
000076      000000                              HALT
000100      000102                              .+2
000102      000000                              HALT
000104      000106                              .+2
000106      000000                              HALT
000110      000112                              .+2
000112      000000                              HALT
000114      000116                              .+2
000116      000000                              HALT
000120      000122                              .+2
000122      000000                              HALT
000124      000126                              .+2
000126      000000                              HALT
000130      000132                              .+2
000132      000000                              HALT
```

```
  347  000134  000136                    .+2
  348  000136  000000                    HALT
  349  000140  000142                    .+2
  350  000142  000000                    HALT
  351  000144  000146                    .+2
  352  000146  000000                    HALT
  353  000150  000152                    .+2
  354  000152  000000                    HALT
  355  000154  000156                    .+2
  356  000156  000000                    HALT
  357  000160  000162                    .+2
  358  000162  000000                    HALT
  359  000164  000166                    .+2
  360  000166  000000                    HALT
  361  000170  000172                    .+2
  362  000172  000000                    HALT
  363  000174  000176                    .+2
  364  000176  000000                    HALT
  365  000200  000202                    .+2
  366  000202  000000                    HALT
  367  000204  000206                    .+2
  368  000206  000000                    HALT
  369  000210  000212                    .+2
  370  000212  000000                    HALT
  371  000214  000216                    .+2
  372  000216  000000                    HALT
  373  000220  000222                    .+2
  374  000222  000000                    HALT
  375  000224  000226                    .+2
  376  000226  000000                    HALT
  377  000230  000232                    .+2
  378  000232  000000                    HALT
  379  000234  000236                    .+2
  380  000236  000000                    HALT
  381  000240  000242                    .+2
  382  000242  000000                    HALT
  383  000244  000246                    .+2
  384  000246  000000                    HALT
  385  000250  000252                    .+2
  386  000252  000000                    HALT
  387  000254  000256                    .+2
  388  000256  000000                    HALT
  389  000260  000262                    .+2
  390  000262  000000                    HALT
  391  000264  000266                    .+2
  392  000266  000000                    HALT
  393  000270  000272                    .+2
  394  000272  000000                    HALT
  395  000274  000276                    .+2
  396  000276  000000                    HALT
  397  000300  000302                    .+2
  398  000302  000000                    HALT
  399  000304  000306                    .+2
  400  000306  000000                    HALT
  401  000310  000312                    .+2
  402  000312  000000                    HALT
```

```
   403  000314  000316                  .+2
   404  000316  000000                  HALT
   405  000320  000322                  .+2
   406  000322  000000                  HALT
   407  000324  000326                  .+2
   408  000326  000000                  HALT
   409  000330  000332                  .+2
   410  000332  000000                  HALT
   411  000334  000336                  .+2
   412  000336  000000                  HALT
   413  000340  000342                  .+2
   414  000342  000000                  HALT
   415  000344  000346                  .+2
   416  000346  000000                  HALT
   417  000350  000352                  .+2
   418  000352  000000                  HALT
   419  000354  000356                  .+2
   420  000356  000000                  HALT
   421  000360  000362                  .+2
   422  000362  000000                  HALT
   423  000364  000366                  .+2
   424  000366  000000                  HALT
   425  000370  000372                  .+2
   426  000372  000000                  HALT
   427  000374  000376                  .+2
   428  000376  000000                  HALT
   429
   430          000010                  .=ERRVEC
   431  000010  000400                  .WORD   SHLT            ;SET USER HALT TRAP
   432          000030                  .=EMTVEC
   433  000030  000432                  .WORD   SCOPEA          ;SET SCOPE (EMT) TRAP VECTOR
   434          000250                  .=MMVEC
   435  000250  000462                  .WORD   MMERR           ;SET SEG. ERROR TRAP VECTOR
   436
   437
   438          000046                  .=46
   439  000046  007730                  $ENDAD
   440          000052                  .=52
   441  000052  000000                  000000
   442          000200                  .=200
   443  000200  000167  000664          JMP     START           ;GO START TEST
```

```
                        000400                          .=400
                                                ;USER HALT TRAP SERVICE ROUTINE.
000400  162716  000002          SHLT:   SUB     #2,(KSP)        ;ADJUST PC
000404  005776  000000                  TST     @(KSP)          ;CHECK IF HLT CAUSED TRAP
000410  001404                          BEQ     SHLTA
000412  062716  000002                  ADD     #2,(KSP)        ;RESTORE PC
000416  000167  177364                  JMP     6               ;GO HALT AT 6
000422  042766  140000  000002  SHLTA:  BIC     #UM,2(KSP)      ;KERNEL MODE ON RETURN
000430  000002                          RTI                     ;RETURN

                                                ;SCOPE (EMT) SERVICE ROUTINE
000432  011601                SCOPEA: MOV     (KSP),R1        ;SAVE RETURN ADDRESS IN R1
000434  012706  001060                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
000440  005046                          CLR     -(KSP)
000442  010146                          MOV     R1,-(KSP)
000444  012746  000600                  MOV     #UPTR,-(KSP)
000450  012737  030000  177776          MOV     #PUM,@#PSW      ;PREVIOUS USER MODE
000456  006606                          MTPI    USP             ;SET USER STACK PTR
000460  000002                          RTI                     ;RETURN & START NEXT TEST

                                                ;SEGMENTATION ERROR SERVICE
000462  013767  177572  000312  MMERR:  MOV     @#SR0,SSR0T     ;SAVE SR0
000470  005037  177572                  CLR     @#SR0
000474  000137  000252                  JMP     @#MMVEC+2

                        001000                          .=1000
                                        ;TAGS
001000  000000          ICNT:   0                       ;CONTAINS PASS COUNT
001002  000000          SSR0T:  0                       ;CONTAINS SSR0 CONTENTS ON ERROR
001004  000000          TEMP:   0
                        001014                          .=.+6
001014  000000                  FTITLE: 0               ;TITLE FLAG
001016  000000                  PASCNT: 0
```

```
                                                .=1070
                                        ;START SEGMENTATION TEST-S5
001070  000240                          START:  NOP
001072  005067  177702                          CLR     ICNT                    ;CLEAR PASS COUNT
001076  005767  177712                          TST     FTITLE          ;HAS TITLE BEEN PRINTED?
001102  001043                                  BNE     BEGIN           ;YES, SKIP TITLE
001104  023737  000042  000046                  CMP     @#42,@#46       ;ARE WE IN ACT11 AUTOMATIC MODE?
001112  001437                                  BEQ     BEGIN           ;YES, SKIP TITLE
001114  012700  001146                          MOV     #TITLE,R0       ;GET MESSAGE ADDRESS
001120  012767  000001  177666                  MOV     #1,FTITLE       ;SET FLAG
001126  105767  176432                  1$:     TSTB    TPS
001132  100375                                  BPL     1$
001134  105710                                  TSTB    (0)             ;END OF MESSAGE?
001136  001425                                  BEQ     BEGIN           ;YES, GET OVER THE ASCII
001140  112067  176422                          MOVB    (0)+,TPB        ;PRINT CHARACTER
001144  000770                                  BR      1$              ;GO DO THE NEXT ONE
001146  005015  052115  044520          TITLE:  .ASCIZ <15><12>@MTPI/MFPI WITH MEM MAN, DBKTC-B@<15><12>
001154  046457  050106  020111
001162  044527  044124  046440
001170  046505  046440  047101
001176  020054  041104  052113
001204  026503  006502  000012
                                                .EVEN
001212  005037  177776          BEGIN:  CLR     @#PSW           ;KERNEL MODE!!! PREV KERNEL MODE!!
001216  012706  001060                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
001222  104000                          SCOPE                   ;SCOPE SETS UP ALL STACK PTRS
001224  012737  000462  000250          MOV     #MMERR,@#MMVEC
001232  005037  000252                  CLR     @#MMVEC+2       ;KERNEL MODE ON SEG ABORT
001236  000240                          NOP                     ;CLEAR MEMORY MANAGEMENT REGISTERS
001240  005037  177572                  CLR     @#SR0
001244  012702  177600                  MOV     #UPDR0,R2
001250  012703  000010                  MOV     #10,R3
001254  005022                          CLR     (R2)+
001256  077302                          SOB     R3,.-2
001260  012702  177640                  MOV     #UPAR0,R2
001264  012703  000010                  MOV     #10,R3
001270  005022                          CLR     (R2)+
001272  077302                          SOB     R3,.-2
001274  012702  172300                  MOV     #KPDR0,R2
001300  012703  000010                  MOV     #10,R3
001304  005022                          CLR     (R2)+
001306  077302                          SOB     R3,.-2
001310  012702  172340                  MOV     #KPAR0,R2
001314  012703  000010                  MOV     #10,R3
001320  005022                          CLR     (R2)+
001322  077302                          SOB     R3,.-2
001324  012767  073006  170746          MOV     #73006,KPDR0    ;RW,UP 167 BLOCKS
001332  012767  000006  170754          MOV     #6,KPDR6        ;RW,UP 1 BLOCK
001340  012767  077406  170750          MOV     #77406,KPDR7    ;RW,UP 200 BLOCKS
001346  012767  000006  176234          MOV     #6,UPDR4        ;RW,UP 1 BLOCK
001354  012767  000006  176230          MOV     #6,UPDR5        ;RW,UP 1 BLOCK
001362  005067  170752                  CLR     KPAR0           ;VA=PA=0000-12077
001366  012767  000167  170760          MOV     #167,KPAR6      ;VA=140000-140077;PA=16700-16777
001374  012767  007600  170754          MOV     #7600,KPAR7     ;VA=160000-177776,PA=760000-777776
```

```
   537  001402  012767  000173  176240          MOV     #173,UPAR4      ;VA=100000-100077/PA=17300-17377
   538  001410  012767  000172  176234          MOV     #172,UPAR5      ;VA=120000-120077/PA=17200-17277
```

```
                                        ;TESTS KK0-KK16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV KERNEL MODE.
                                        ;*********************************
                016600                          VIRT=16600              ;KERNEL VIRTUAL ADDRESS FOR THESE TESTS
                016600                          PHYS=16600              ;CORRESPONDING KERNEL PHYSICAL ADDRESS
                                        ;*********************************

                                        ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
001416  005016                                    CLR     (KSP)           ;PUT 0 ON KERNEL STACK
001420  012702  177777                            MOV     #-1,R2          ;PRESET REGISTER
001424  005237  177572                            INC     @#SR0           ;ENABLE KT11

001430  006602                          KK0:      MTPI    R2              ;R2←(KSP)+
001432  016703  176340                            MOV     PSW,R3          ;SAVE STATUS RESULT
001436  005037  177572                            CLR     @#SR0           ;DISABLE KT11
001442  022706  001062                            CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
001446  001401                                    BEQ     .+4
001450  000000                                    HLT                     ;ERROR!  INCORRECT STACK PTR
001452  122703  000004                            CMPB    #Z,R3   ;CHECK STATUS RESULT
001456  001401                                    BEQ     .+4
001460  000000                                    HLT                     ;ERROR! INCORRECT STATUS RESULT
001462  005702                                    TST     R2              ;CHECK RESULT
001464  001401                                    BEQ     .+4
001466  000000                                    HLT                     ;ERROR!  INCORRECT RESULT
001470  104000                                    SCOPE


                                        ;TEST THAT MTPI CAN LOAD KERNEL ADDRESS (VIRT)
                                        ;DM=1

001472  005016                                    CLR     (KSP)           ;PUT 0 ON KERNEL STACK
001474  012702  016600                            MOV     #VIRT,R2                ;R2=VIRT ADDRESS
001500  012737  177777  016600                    MOV     #-1,@#PHYS      ;PRESET DATA
001506  005237  177572                            INC     @#SR0           ;ENABLE KT11

001512  000277                                    SCC
001514  006612                          KK1:      MTPI    (R2)            ;VIRT←(KSP)+
001516  016703  176254                            MOV     PSW,R3          ;SAVE STATUS RESULT
001522  005037  177572                            CLR     @#SR0           ;DISABLE KT11
001526  022706  001062                            CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
001532  001401                                    BEQ     .+4
001534  000000                                    HLT                     ;ERROR! INCORRECT STACK PTR
001536  122703  000005                            CMPB    #Z+C,R3         ;CHECK STATUS RESULT
001542  001401                                    BEQ     .+4
001544  000000                                    HLT                     ;ERROR! INCORRECT STATUS RESULT
001546  005737  016600                            TST     @#PHYS          ;CHECK RESULT
001552  001401                                    BEQ     .+4
001554  000000                                    HLT                     ;ERROR! INCORRECT RESULT
001556  104000                                    SCOPE

                                        ;DM=2
001560  012737  000000  177776                    MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
001566  012716  177777                            MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
001572  012702  016600                            MOV     #VIRT,R2        ;R2=VIRT ADDRESS
001576  005037  016600                            CLR     @#PHYS          ;PRESET DATA
001602  005237  177572                            INC     @#SR0           ;ENABLE KT11
```

```
                                                    ;DM=4
001710  005016                            CLR     (KSP)           ;PUT 0 ON KERNEL STACK
001712  012704  016602                    MOV     #VIRT+2,R4      ;LOAD ADDRESS
001716  012737  177777  016600            MOV     #-1,@#PHYS      ;PRESET DATA
001724  005237  177572                    INC     @#SR0           ;ENABLE KT11

001730  006644                  KK4:      MTPI    -(R4)           ;VIRT←(KSP)+
001732  005037  177572                    CLR     @#SR0           ;DISABLE KT11
001736  022704  016600                    CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
001742  001401                            BEQ     .+4
001744  000000                            HLT                     ;ERROR! AUTO-DECREMENT FAILED
001746  005737  016600                    TST     @#PHYS          ;CHECK RESULT
001752  001401                            BEQ     .+4
001754  000000                            HLT                     ;ERROR! INCORRECT RESULT
001756  104000                            SCOPE

                                                    ;DM=5
001760  012737  000000  177776            MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
001766  012716  177777                    MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
001772  012702  001010                    MOV     #TEMP+4,R2      ;LOAD INDIRECT ADDRESS
001776  012767  016600  177002            MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
002004  005037  016600                    CLR     @#PHYS          ;PRESET DATA
002010  005237  177572                    INC     @#SR0           ;ENABLE KT11

002014  006652                  KK5:      MTPI    @-(R2)          ;VIRT←(KSP)+
002016  005037  177572                    CLR     @#SR0           ;DISABLE KT11
002022  005237  016600                    INC     @#PHYS          ;CHECK RESULT
002026  001401                            BEQ     .+4
002030  000000                            HLT                     ;ERROR! INCORRECT RESULT
002032  005067  175740                    CLR     PSW
002036  104000                            SCOPE
```

```
                                        ;DM=6
002040  012737  000000  177776          MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
002046  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
002050  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
002054  012767  177777  014520          MOV     #-1,PHYS+2      ;PRESET DATA
002062  005237  177572                  INC     @#SR0           ;ENABLE KT11

002066  006662  016600          KK6:    MTPI    VIRT(R2)        ;VIRT+2+(KSP)+
002072  016700  175700                  MOV     PSW,R0          ;SAVE STATUS RESULT
002076  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002102  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
002106  001401                          BEQ     .+4
002110  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
002112  122700  000004                  CMPB    #Z,R0   ;CHECK STATUS RESULT
002116  001401                          BEQ     .+4
002120  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
002122  005737  016602                  TST     @#PHYS+2                ;CHECK RESULT
002126  001401                          BEQ     .+4
002130  000000                          HLT                     ;ERROR! INCORRECT RESULT
002132  104000                          SCOPE

                                        ;DM=7
002134  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002140  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
002144  012737  016600  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
002152  005037  016600                  CLR     @#PHYS          ;PRESET DATA
002156  005237  177572                  INC     @#SR0           ;ENABLE KT11

002162  006672  001006          KK7:    MTPI    @TEMP+2(R2)     ;VIRT+(KSP)+
002166  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002172  005237  016600                  INC     @#PHYS          ;CHECK RESULT
002176  001401                          BEQ     .+4
002200  000000                          HLT                     ;ERROR! INCORRECT RESULT
002202  104000                          SCOPE

                                ;TEST THAT MTPI CAN LOAD KERNEL
                                ;DM=1,PC
002204  012716  000403          KK10B:  MOV     #403,(KSP)      ;PUT BR .+10 INST AS DATA ON STACK
002210  005037  002222                  CLR     @#KK10A ;PUT HALT FOLLOWING MTPI
002214  005237  177572                  INC     @#SR0           ;ENABLE KT11

002220  006617          KK10:   MTPI    (PC)            ;KK10A+(KSP)+
002222  000000          KK10A:  HALT                    ;ERROR!  MTPI DID NOT POP BR .+10
                                                        ;INTO KK10A
002224  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002230  000765                          BR      KK10B           ;LOOP TEST IF ERROR
002232  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002236  104000                          SCOPE

                                ;DM=2,PC
002240  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002244  005067  000006                  CLR     KK11A
002250  005237  177572                  INC     @#SR0           ;ENABLE KT11

002254  006627          KK11:   MTPI    (PC)+           ;(PC)++(KSP)+
```

```
                                                ;DM=3,PC
002276  012737  000000  177776          MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
002304  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002310  005037  016600                  CLR     @#PHYS
002314  005237  177572                  INC     @#SR0           ;ENABLE KT11

002320  006637  016600          KK12:   MTPI    @#VIRT          ;VIRT←(KSP)+
002324  016700  175446                  MOV     PSW,R0          ;SAVE STATUS RESULT
002330  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002334  122700  000010                  CMPB    #N,R0   ;CHECK STATUS RESULT
002340  001401                          BEQ     .+4
002342  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
002344  005267  014230                  INC     PHYS            ;CHECK RESULT
002350  001401                          BEQ     .+4
002352  000000                          HLT                     ;ERROR!  INCORRECT RESULT
002354  005067  175416                  CLR     PSW
002360  104000                          SCOPE

                                                ;DM=4,PC
002362  012737  000000  177776          MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
002370  012716  000401                  MOV     #401,(KSP)      ;PUT BR .+4 ON STACK AS DATA
002374  016702  000004                  MOV     KK13,R2 ;SAVE MTPI INSTRUCTION
002400  005237  177572                  INC     @#SR0           ,ENABLE KT11

002404  006647                  KK13:   MTPI    -(PC)           ;-(PC)←(KSP)+
002406  000000                          HALT                    ;ERROR!  MTPI - (PC) FAILED
002410  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002414  010267  177764                  MOV     R2,KK13 ;RESTORE INSTRUCTION
002420  104000                          SCOPE

                                                ;DM=6,PC
002422  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
002424  012767  177777  014152          MOV     #-1,PHYS+4
002432  005237  177572                  INC     @#SR0           ;ENABLE KT11

002436  000277                          SCC
002440  006667  014140          KK14:   MTPI    VIRT+4          ;VIRT+4←(KSP)+
002444  016703  175326                  MOV     PSW,R3          ;SAVE STATUS RESULT
002450  005037  177572                  CLR     @#SR0           ;DISABLE KT11
002454  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
002460  001401                          BEQ     .+4
002462  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
002464  122703  000005                  CMPB    #Z+C,R3 ;CHECK STATUS RESULT
002470  001401                          BEQ     .+4
002472  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
002474  005737  016604                  TST     @#PHYS+4                ;CHECK RESULT
002500  001401                          BEQ     .+4
002502  000000                          HLT                     ;ERROR!  INCORRECT RESULT
```

```
763  002504  104000                          SCOPE
764                                ;DM=7,PC
765
766  002506  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!,PREV KERNEL MODE!!
767  002512  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
768  002516  012737  016604  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
769  002524  005037  016604                  CLR     @#PHYS+4                ;PRESET DATA
770  002530  005237  177572                  INC     @#SR0           ;ENABLE KT11
771
772
773  002534  006677  176244          KK15:   MTPI    @TEMP           ;VIRT+4←(KSP)+
774  002540  005037  177572                  CLR     @#SR0           ;DISABLE KT11
775  002544  005237  016604                  INC     @#PHYS+4                ;CHECK RESULT
776  002550  001401                          BEQ     .+4
777  002552  000000                          HLT                     ;ERROR INCORRECT RESULT
778  002554  104000                          SCOPE
779
780
781                                ;CHECK THAT MTPI CAN SET STACK PTR
782  002556  012737  000000  177776          MOV     #0,@#PSW        ;KERNEL MODE!!!,PREV KERNEL MODE
783  002564  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
784  002566  005237  177572                  INC     @#SR0           ;ENABLE KT11
785
786  002572  006606                  KK16:   MTPI    KSP             ;KSP←(KSP)+
787  002574  005037  177572                  CLR     @#SR0           ;DISABLE KT11
788  002600  005706                          TST     KSP             ;CHECK STACK PTR
789  002602  001401                          BEQ     .+4
790  002604  000000                          HLT                     ;ERROR!
791  002606  012706  001060                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
792  002612  104000                          SCOPE
793
794                                ;TESTS KU0-KU16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV USER MODE.
795                                ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
796  002614  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
797  002622  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
798  002624  012702  177777                  MOV     #-1,R2          ;PRESET REGISTER
799  002630  005237  177572                  INC     @#SR0           ;ENABLE KT11
800
801  002634  006602                  KU0:    MTPI    R2              ;R2←(KSP)+
802  002636  016703  175134                  MOV     PSW,R3          ;SAVE STATUS RESULT
803  002642  005037  177572                  CLR     @#SR0           ;DISABLE KT11
804  002646  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
805  002652  001401                          BEQ     .+4
806  002654  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
807  002656  122703  000344                  CMPB    #PRTY7+Z,R3     ;CHECK STATUS RESULT
808  002662  001401                          BEQ     .+4
809  002664  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
810  002666  005702                          TST     R2              ;CHECK RESULT
811  002670  001401                          BEQ     .+4
812  002672  000000                          HLT                     ;ERROR!  INCORRECT RESULT
813  002674  104000                          SCOPE
814                                ;TEST MFPI INSTRUCUTION KERNEL MODE PREVIOUS KERNEL MODE.
815                                ;TEST THAT MFPI CAN GET DATA FROM A GENRAL REGISTER (R3)
816  002676  012767  000340  175072          MOV     #PRTY7,PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
817  002704  005066  177776                  CLR     -2(KSP)
818  002710  012703  177777                  MOV     #-1,R3          ;PRESET GENERAL REGISTER
```

```
819  002714  005237  177572            KKF0:   INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
820  002720  006503                            MFPI    R3              ;-(KSP)←R3
821  002722  016702  175050                    MOV     PSW,R2          ;SAVE CC'S
822  002726  005037  177572                    CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
823  002732  122702  000350                    CMPB    #PRTY7+N,R2     ;CHECK CC'S
824  002736  001401                            BEQ     .+4
825  002740  000000                            HLT                     ;ERROR! INCORRECT CC'S AFTER MFPI
826  002742  022706  001056                    CMP     #KPTR-2,KSP     ;CHECK THAT STACK WAS PUSHED
827  002746  001401                            BEQ     .+4
828  002750  000000                            HLT                     ;ERROR! INCORRECT STACK PTR
829  002752  005216                            INC     (KSP)           ;CHECK RESULT
830  002754  001401                            BEQ     .+4
831  002756  000000                            HLT                     ;ERROR! INCORRECT RESULT
832  002760  104000                            SCOPE
833
834                                     ;TEST THAT MFPI CAN GET DATA FROM A KERNEL VIRTUAL ADDRESS
835                                     ;DM=1
836  002762  005067  175010                    CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
837  002766  005066  177776                    CLR     -2(KSP)
838  002772  012702  016600                    MOV     #VIRT,R2        ;R2=VIRTUAL ADDRESS
839  002776  012737  177777  016600            MOV     #-1,@#PHYS      ;PRESET PHYSICAL ADDRESS
840  003004  005237  177572                    INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
841  003010  000277                            SCC                     ;PRESET CC'S
842  003012  006512                    KKF1:   MFPI    (R2)            ;-(KSP)←(R2)
843  003014  016703  174756                    MOV     PSW,R3          ;SAVE CC'S
844  003020  005037  177572                    CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
845  003024  122703  000011                    CMPB    #N+C,R3         ;CHECK CC'S
846  003030  001401                            BEQ     .+4
847  003032  000000                            HLT                     ;ERROR! INCORRECT CC'S
848  003034  022706  001056                    CMP     #KPTR-2.KSP     ;CHECK THAT STACK WAS PUSHED
849  003040  001401                            BEQ     .+4
850  003042  000000                            HLT                     ;ERROR! INCORRECT STACK PTR
851  003044  005216                            INC     (KSP)           ;CHECK RESULT
852  003046  001401                            BEQ     .+4
853  003050  000000                            HLT                     ;ERROR! INCORRECT RESULT
854  003052  104000                            SCOPE
855
856                                     ;DM=2
857  003054  012767  000000  174714            MOV     #0,PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
858  003062  012766  177777  177776            MOV     #-1,-2(KSP)
859  003070  012702  016600                    MOV     #VIRT,R2        ;R2=VIRTUAL ADDRESS
860  003074  005037  016600                    CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS
861  003100  005237  177572                    INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
862  003104  006522                    KKF2:   MFPI    (R2)+           ;-(KSP)←VIRT
863  003106  005037  177572                    CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
864  003112  005716                            TST     (KSP)           ;CHECK RESULT
865  003114  001401                            BEQ     .+4
866  003116  000000                            HLT                     ;ERROR! INCORRECT RESULT ON STACK
867  003120  022702  016602                    CMP     #VIRT+2,R2      ;CHECK AUTO INCREMENT
868  003124  001401                            BEQ     .+4
869  003126  000000                            HLT                     ;ERROR! AUTO INCREMENT FAILED
870  003130  005067  174642                    CLR     PSW
871  003134  104000                            SCOPE
872
873                                     ;DM=3
874  003136  005067  174634                    CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
```

```
                                                CLR     -2(KSP)
                                                MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
                                                MOV     #VIRT+2,@#TEMP  ;LOAD ADDRESS
                                                MOV     #-1,@#PHYS+2    ;PRESET DATA
                                                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
                                        KKF3:   MFPI    @(R2)+          ;-(KSP)←VIR'+2
                                                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
                                                INC     (KSP)           ;CHECK RESULT
                                                BEQ     .+4
                                                HLT                     ;ERROR! INCORRECT RESULT
                                                SCOPE

                                        ;DM=4
                                                CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
                                                MOV     #-1,-2(KSP)
                                                MOV     #VIRT+2,R4      ;R4=VIRTUAL ADDRESS+2
                                                CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
                                                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
                                        KKF4:   MFPI    -(R4)           ;-(KSP)←VIRT
                                                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
                                                CMP     #VIRT,R4        ;CHECK AUTO-DECREMENT
                                                BEQ     .+4
                                                HLT                     ;ERROR! AUTO-DECREMENT FAILED
                                                TST     (KSP)           ;CHECK RESULT
                                                BEQ     .+4
                                                HLT                     ;ERROR! INCORRECT RESULT
                                                SCOPE

                                        ;DM=5
                                                MOV     #0,PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
                                                CLR     -2(KSP)
                                                MOV     #TEMP+2,R0      ;R1=INDIRECT ADDRESS
                                                MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
                                                MOV     #-1,@#PHYS+4    ;PRESET PHYSICAL ADDRESS DATA
                                                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
                                        KKF5:   MFPI    @-(R0)          ;-(KSP)←VIRT+4
                                                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
                                                INC     (KSP)           ;CHECK RESULT
                                                BEQ     .+4
                                                HLT
                                                CLR     PSW
                                                SCOPE

                                        ;DM=6
                                                MOV     #0,PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
                                                MOV     #-1,-2(KSP)
                                                MOV     #2,R2           ;LOAD INDEX REGISTER
                                                CLR     @#PHYS+2        ;PRESET PHYSICAL ADDRESS DATA
                                                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
                                        KKF6:   MFPI    VIRT(R2)        ;-(KSP)←VIRT-2
                                                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
                                                CMP     #KPTR-2,KSP     ;CHECK STACK PTR
                                                BEQ     .+4
                                                HLT                     ;ERROR! INCORRECT STACK PTR
                                                TST     (KSP)           ;CHECK RESULT
                                                BEQ     .+4
```

```
                                                HLT                     ;ERROR! INCORRECT RESULT
003422  005067  174350                          CLR     PSW
003426  104000                                  SCOPE

                                ;DM=7
003430  005067  174342                          CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
003434  005066  177776                          CLR     -2(KSP)
003440  012702  177774                          MOV     #-4,R2          ;LOAD INDEX REGISTER
003444  012737  016600  001004                  MOV     #VIRT,@#TEMP    ;LOAD ADDRESS
003452  012737  177777  016600                  MOV     #-1,@#PHYS      ;CLEAR PHYSICAL ADDRESS DATA
003460  005237  177572                          INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
003464  006572  001010          KKF7:   MFPI    @TEMP+4(R2)     ;-(KSP)←VIRT
003470  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
003474  005216                          INC     (KSP)           ;CHECK RESULT
003476  001401                          BEQ     .+4
003500  000000                          HLT                     ;ERROR! INCORRECT RESULT
003502  104000                          SCOPE

                                ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
                                ;DM=0,PC
003504  005067  174266                          CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
003510  012706  001060                          MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
003514  005066  177776                          CLR     -2(KSP)
003520  005237  177572                          INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
003524  000277                                  SCC
003526  006507          KKF10:  MFPI    PC              ;-(KSP)←PC
003530  016702  174242                  MOV     PSW,R2          ;SAVE CC'S
003534  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
003540  122702  000001                  CMPB    #C,R2           ;CHECK CC'S
003544  001401                          BEQ     .+4
003546  000000                          HLT
003550  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
003554  001401                          BEQ     .+4
003556  000000                          HLT                     ;ERROR! STACK NOT PUSHED
003560  022716  003530                  CMP     #KKF10+2,(KSP)  ;CHECK THAT PS WAS PUSHED ON THE STACK
003564  001401                          BEQ     .+4
003566  000000                          HLT                     ;ERROR! PC NOT PUSHED ON THE STACK
003570  104000                          SCOPE


                                ;DM=3,PC
003572  012767  000000  174176                  MOV     #0,PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
003600  005066  177776                          CLR     -2(KSP)
003604  012737  177777  016600                  MOV     #-1,@#PHYS
003612  005237  177572                          INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
003616  006537  016600          KKF11:  MFPI    @#VIRT          ;-(KSP)←VIRT
003622  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
003626  005216                          INC     (KSP)           ;CHECK RESULT
003630  001401                          BEQ     .+4
003632  000000                          HLT                     ;ERROR! INCORRECT RESULT
003634  104000                          SCOPE

                                ;DM=6,PC
003636  012767  000340  174132                  MOV     #PRTY7,PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
003644  012766  177777  177776                  MOV     #-1,-2(KSP)
```

```
  987  003652  005037  016600                 CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
  988  003656  005237  177572                 INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
  989  003662  006567  012712         KKF12:  MFPI    VIRT            ;-(KSP)←VIRT
  990  003666  005037  177572                 CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
  991  003672  005716                         TST     (KSP)           ;CHECK RESULT
  992  003674  001401                         BEQ     .+4
  993  003676  000000                         HLT                     ;ERROR! INCORRECT RESULT
  994  003700  104000                         SCOPE
  995
  996                                  ;DM=7,PC
  997  003702  005067  174070                 CLR     PSW             ;KERNEL MODE!!!,PREV KERNEL MODE!!
  998  003706  005066  177776                 CLR     -2(KSP)
  999  003712  012737  016604  001004         MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
 1000  003720  012737  177777  016604         MOV     #-1,@#PHYS+4    ;PRESET DATA
 1001  003726  005237  177572                 INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
 1002  003732  000277                         SCC
 1003  003734  006577  175044         KKF13:  MFPI    @TEMP           ;-(KSP)←VIRT+4
 1004  003740  016702  174032                 MOV     PSW,R2          ;SAVE CC'S
 1005  003744  005037  177572                 CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
 1006  003750  122702  000011                 CMPB    #N+C,R2         ;CHECK CC'S
 1007  003754  001401                         BEQ     .+4
 1008  003756  000000                         HLT                     ;ERROR! INCORRECT CC'S
 1009  003760  005216                         INC     (KSP)           ;CHECK RESULT
 1010  003762  001401                         BEQ     .+4
 1011  003764  000000                         HLT                     ;ERROR! INCORRECT RESULT ON STACK
 1012  003766  104000                         SCOPE
 1013
 1014                                  ;DM=1,PC
 1015  003770  012766  177777  177776         MOV     #-1,-2(KSP)
 1016  003776  005237  177572                 INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
 1017  004002  006517                 KKF14:  MFPI    (PC)            ;PUSH NEXT WORD ON THE STACK
 1018  004004  000400                 KKF14A: BR      .+2             ;THIS DATA GOES ONTO THE STACK
 1019  004006  005037  177572                 CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
 1020  004012  023716  004004                 CMP     @#KKF14A,(KSP)  ;CHECK DATA ON THE STACK
 1021  004016  001401                         BEQ     .+4
 1022  004020  000000                         HLT                     ;ERROR! INCORRECT DATA ON STACK
 1023  004022  104000                         SCOPE
 1024
 1025
 1026                                  ;TEST THAT KERNEL CAN LOAD USER ADDRESS (VIRT)
 1027                                  ;DM=1
 1028
 1029                                  ;*********************************
 1030          120000                          VIRT=120000     ;USER VIRTUAL ADDRESS FOR THESE TESTS
 1031          017200                          PHYS=17200      ;CORRESPONDING PHYSICAL ADDRESS
 1032                                  ;*********************************
 1033
 1034  004024  012737  030000  177776         MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
 1035  004032  005016                         CLR     (KSP)           ;PUT 0 ON KERNEL STACK
 1036  004034  012702  120000                 MOV     #VIRT,R2                ;R2=VIRT ADDRESS
 1037  004040  012737  177777  017200         MOV     #-1,@#PHYS      ;PRESET DATA
 1038  004046  005237  177572                 INC     @#SR0           ;ENABLE KT11
 1039
 1040  004052  000277                         SCC
 1041  004054  006612                 KU1:    MTPI    (R2)            ;VIRT←(KSP)+
 1042  004056  016703  173714                 MOV     PSW,R3          ;SAVE STATUS RESULT
```

```
1043  004062  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1044  004066  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
1045  004072  001401                          BEQ     .+4
1046  004074  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
1047  004076  122703  000005                  CMPB    #Z+C,R3         ;CHECK STATUS RESULT
1048  004102  001401                          BEQ     .+4
1049  004104  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
1050  004106  005737  017200                  TST     @#PHYS          ;CHECK RESULT
1051  004112  001401                          BEQ     .+4
1052  004114  000000                          HLT                     ;ERROR! INCORRECT RESULT
1053  004116  104000                          SCOPE
1054
1055                                  ;DM=2
1056  004120  012737  030000  177776          MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1057  004126  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1058  004132  012702  120000                  MOV     #VIRT,R2        ;R2=VIRT ADDRESS
1059  004136  005037  017200                  CLR     @#PHYS          ;PRESET DATA
1060  004142  005237  177572                  INC     @#SR0           ;ENABLE KT11
1061
1062  004146  006622                  KU2:    MTPI    (R2)+           ;VIRT←(KSP)+
1063  004150  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1064  004154  005237  017200                  INC     @#PHYS          ;CHECK RESULT
1065  004160  001401                          BEQ     .+4
1066  004162  000000                          HLT                     ;ERROR! INCORRECT RESULT
1067  004164  022702  120002                  CMP     #VIRT+2,R2      ;CHECK AUTO-INCREMENT
1068  004170  001401                          BEQ     .+4
1069  004172  000000                          HLT                     ;ERROR! AUTO-INCREMENT FAILED
1070  004174  005067  173576                  CLR     PSW
1071  004200  104000                          SCOPE
1072                                  ;DM=3
1073  004202  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1074  004210  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1075  004214  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
1076  004220  012712  120004                  MOV     #VIRT+4,(R2)    ;LOAD ADDRESS
1077  004224  005037  017204                  CLR     @#PHYS+4        ;PRESET DATA
1078  004230  005237  177572                  INC     @#SR0           ;ENABLE KT11
1079
1080  004234  006632                  KU3:    MTPI    @(R2)+          ;VIRT+4←(KSP)+
1081  004236  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1082  004242  005237  017204                  INC     @#PHYS+4                ;CHECK RESULT
1083  004246  001401                          BEQ     .+4
1084  004250  000000                          HLT                     ;ERROR! INCORRECT RESULT
1085  004252  104000                          SCOPE
1086
1087                                  ;DM=4
1088  004254  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1089  004262  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
1090  004264  012704  120002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
1091  004270  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET DATA
1092  004276  005237  177572                  INC     @#SR0           ;ENABLE KT11
1093
1094  004302  006644                  KU4:    MTPI    -(R4)           ;VIRT←(KSP)+
1095  004304  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1096  004310  022704  120000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
1097  004314  001401                          BEQ     .+4
1098  004316  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
```

```
1099  004320  005737  017200            TST     @#PHYS          ;CHECK RESULT
1100  004324  001401                    BEQ     .+4
1101  004326  000000                    HLT                     ;ERROR! INCORRECT RESULT
1102  004330  104000                    SCOPE
1103
1104                            ;DM=5
1105  004332  012737  030000  177776    MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1106  004340  012716  177777            MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1107  004344  012702  001010            MOV     #TEMP+4,R2      ;LOAD INDIRECT ADDRESS
1108  004350  012767  120000  174430    MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
1109  004356  005037  017200            CLR     @#PHYS          ;PRESET DATA
1110  004362  005237  177572            INC     @#SR0           ;ENABLE KT11
1111
1112  004366  006652                KU5:  MTPI    @-(R2)          ;VIRT+(KSP)+
1113  004370  005037  177572            CLR     @#SR0           ;DISABLE KT11
1114  004374  005237  017200            INC     @#PHYS          ;CHECK RESULT
1115  004400  001401                    BEQ     .+4
1116  004402  000000                    HLT                     ;ERROR! INCORRECT RESULT
1117  004404  005067  173366            CLR     PSW
1118  004410  104000                    SCOPE
1119
1120                            ;DM=6
1121  004412  012737  030000  177776    MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1122  004420  005016                    CLR     (KSP)           ;PUT 0 ON KERNEL STACK
1123  004422  012702  000002            MOV     #2,R2           ;LOAD INDEX REGISTER
1124  004426  012767  177777  012546    MOV     #-1,PHYS+2      ;PRESET DATA
1125  004434  005237  177572            INC     @#SR0           ;ENABLE KT11
1126
1127  004440  006662  120000        KU6:  MTPI    VIRT(R2)        ;VIRT+2+(KSP)+
1128  004444  016700  173326            MOV     PSW,R0          ;SAVE STATUS RESULT
1129  004450  005037  177572            CLR     @#SR0           ;DISABLE KT11
1130  004454  022706  001062            CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
1131  004460  001401                    BEQ     .+4
1132  004462  000000                    HLT                     ;ERROR! INCORRECT STACK PTR
1133  004464  122700  000004            CMPB    #Z,R0   ;CHECK STATUS RESULT
1134  004470  001401                    BEQ     .+4
1135  004472  000000                    HLT                     ;ERROR! INCORRECT STATUS RESULT
1136  004474  005737  017202            TST     @#PHYS+2                ;CHECK RESULT
1137  004500  001401                    BEQ     .+4
1138  004502  000000                    HLT                     ;ERROR! INCORRECT RESULT
1139  004504  104000                    SCOPE
1140
1141                            ;DM=7
1142  004506  012737  030000  177776    MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1143  004514  012716  177777            MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1144  004520  012702  000002            MOV     #2,R2           ;LOAD INDEX REGISTER
1145  004524  012737  120000  001010    MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
1146  004532  005037  017200            CLR     @#PHYS          ;PRESET DATA
1147  004536  005237  177572            INC     @#SR0           ;ENABLE KT11
1148
1149  004542  006672  001006        KU7:  MTPI    @TEMP+2(R2)     ;VIRT+(KSP)+
1150  004546  005037  177572            CLR     @#SR0           ;DISABLE KT11
1151  004552  005237  017200            INC     @#PHYS          ;CHECK RESULT
1152  004556  001401                    BEQ     .+4
1153  004560  000000                    HLT                     ;ERROR! INCORRECT RESULT
1154  004562  104000                    SCOPE
```

```
1155
1156                                        ;TEST THAT MTPI CAN LOAD USER
1157                                        ;DM=0,PC
1158  004564  012737  030000  177776        MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1159  004572  012716  004606                MOV     #KU10A,(KSP)    ;PUT NEW PC ON STACK AS DATA
1160  004576  005237  177572                INC     @#SR0           ;ENABLE KT11
1161
1162  004602  006607                KU10:   MTPI    PC              ;PC←(KSP)+
1163  004604  000000                        HLT                     ;ERROR! MTPI DID NOT LOAD NEW PC
1164  004606  005037  177572        KU10A:  CLR     @#SR0           ;DISABLE KT11
1165  004612  104000                        SCOPE
1166
1167                                        ;DM=2,PC
1168  004614  012737  030000  177776        MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1169  004622  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1170  004626  012767  004646  173414        MOV     #KU11A,MMVEC    ;LOAD SEG ERR VECTOR
1171  004634  005237  177572                INC     @#SR0           ;ENABLE KT11
1172
1173  004640  006627                KU11:   MTPI    (PC)+           ;(PC)+←(KSP)+, SHOULD ABORT
1174  004642  000000                        HLT                     ;ERROR! DID NOT ABORT AND PC DID NOT
1175                                                                ;AUTO-INCREMENT
1176  004644  000000                        HLT                     ;ERROR! DID NOT ABORT
1177  004646  005037  177572        KU11A:  CLR     @#SR0           ;DISABLE KT11
1178  004652  022706  001056                CMP     #KPTR-2,KSP     ;CHECK THAT STACK PTR WAS PUSHED TWICE
1179  004656  001401                        BEQ     .+4
1180  004660  000000                        HLT                     ;ERROR! INCORRECT STACK PTR ON ERROR ABORT
1181  004662  012767  000462  173360        MOV     #MMERR,MMVEC
1182  004670  104000                        SCOPE
1183
1184                                        ;DM=3,PC
1185  004672  012737  030000  177776        MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1186  004700  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1187  004704  005037  017600                CLR     @#PHYS
1188  004710  005237  177572                INC     @#SR0           ;ENABLE KT11
1189
1190  004714  006637  120000        KU12:   MTPI    @#VIRT          ;VIRT←(KSP)+
1191  004720  016700  173052                MOV     PSW,R0          ;SAVE STATUS RESULT
1192  004724  005037  177572                CLR     @#SR0           ;DISABLE KT11
1193  004730  122700  000010                CMPB    #N,R0   ;CHECK STATUS RESULT
1194  004734  001401                        BEQ     .+4
1195  004736  000000                        HLT                     ;ERROR!  INCORRECT STATUS RESULT
1196  004740  005267  012234                INC     PHYS            ;CHECK RESULT
1197  004744  001401                        BEQ     .+4
1198  004746  000000                        HLT                     ;ERROR!  INCORRECT RESULT
1199  004750  005067  173022                CLR     PSW
1200  004754  104000                        SCOPE
1201
1202                                        ;DM=4,PC
1203  004756  012737  030000  177776        MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1204  004764  005016                        CLR     (KSP)           ;PUT 0 ON KERNEL STACK
1205  004766  016702  000012                MOV     KU13,R2 ;SAVE MTPI INSTRUCTION
1206  004772  012767  005010  173250        MOV     #KU13A,MMVEC    ;LOAD SEG ERR VECTOR
1207  005000  005237  177572                INC     @#SR0           ;ENABLE KT11
1208
1209  005004  006647                KU13:   MTPI    -(PC)           ;-(PC)←(KSP)+
1210  005006  000000                        HLT                     ;ERROR! FAILED TO ABORT
```

```
1211  005010  005037  177572          KU13A:  CLR     @#SR0           ;DISABLE KT11
1212  005014  010267  177764                  MOV     R2,KU13 ;RESTORE INSTRUCTION
1213  005020  012767  000462  173222          MOV     #MMERR,MMVEC
1214  005026  104000                          SCOPE
1215
1216                                  ;DM=6,PC
1217  005030  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1218  005036  005016                          CLR     (KSP)           ;PUT 0 ON KERNEL STACK
1219  005040  012767  177777  012136          MOV     #-1,PHYS+4
1220  005046  005237  177572                  INC     @#SR0           ;ENABLE KT11
1221
1222  005052  000277                          SCC
1223  005054  006667  112724          KU14:   MTPI    VIRT+4          ;VIRT+4+(KSP)+
1224  005060  016703  172712                  MOV     PSW,R3          ;SAVE STATUS RESULT
1225  005064  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1226  005070  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
1227  005074  001401                          BEQ     .+4
1228  005076  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
1229  005100  122703  000345                  CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
1230  005104  001401                          BEQ     .+4
1231  005106  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
1232  005110  005737  017204                  TST     @#PHYS+4        ;CHECK RESULT
1233  005114  001401                          BEQ     .+4
1234  005116  000000                          HLT                     ;ERROR!  INCORRECT RESULT
1235  005120  104000                          SCOPE
1236
1237                                  ;DM=7,PC
1238
1239  005122  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1240  005130  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
1241  005134  012737  120004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
1242  005142  005037  017204                  CLR     @#PHYS+4                ;PRESET DATA
1243  005146  005237  177572                  INC     @#SR0           ;ENABLE KT11
1244
1245  005152  006677  173626          KU15:   MTPI    @TEMP           ;VIRT+4+(KSP)+
1246  005156  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1247  005162  005237  017204                  INC     @#PHYS+4                ;CHECK RESULT
1248  005166  001401                          BEQ     .+4
1249  005170  000000                          HLT                     ;ERROR INCORRECT RESULT
1250  005172  104000                          SCOPE
1251
1252
1253                                  ;CHECK THAT MTPI CAN SET USER STACK PTR & PUSH DATA ONTO USER STACK
1254  005174  012737  030000  177776          MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1255  005202  012746  120000                  MOV     #VIRT,-(KSP)
1256  005206  005046                          CLR     -(KSP)          ;PUT DATA ON YHE STACK
1257  005210  012746  120000                  MOV     #VIRT,-(KSP)
1258  005214  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET STACK DATA
1259  005222  005237  177572                  INC     @#SR0           ;ENABLE KT11
1260
1261  005226  006606                  KU16:   MTPI    USP             ;USP+(KSP)+
1262  005230  006636                          MTPI    @(KSP)+         ;VIRT+(KSP)+
1263  005232  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1264  005236  106506                          MFPD    USP             ;GET USER STACK PTR
1265  005240  022716  120000                  CMP     #VIRT,(KSP)     ;CEHECK THAT MTPI  USP SET USER STACK PTR
1266  005244  001401                          BEQ     .+4
```

```
1267  005246  000000                        HLT                     ;ERROR! MTPI  USP FAILED
1268  005250  005737  017200                TST     @#PHYS          ;CHECK THAT MTPI  @(KSP)+ PUT THE
1269  005254  001401                        BEQ     .+4             ;CORRECT DATA ONTO THE USER STACK
1270  005256  000000                        HLT                     ;ERROR! MTPI  @(KSP)+ FAILED
1271  005260  022706  001056                CMP     #KPTR-2,KSP     ;CHECK KERNEL STACK PTR AFTER TEST
1272  005264  001401                        BEQ     .+4
1273  005266  000000                        HLT                     ;ERROR! INCORRECT KERNEL STACK PTR
1274  005270  104000                        SCOPE
1275                                ;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS USER MODE
1276                                ;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R1).
1277  005272  012767  030000  172476        MOV     #PUM,PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1278  005300  012766  177777  177776        MOV     #-1,-2(KSP)
1279  005306  005000                        CLR     R0              ;PRESET REGISTER
1280  005310  005237  177572                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1281  005314  000277                        SCC                     ;PRESET CC'S
1282  005316  006500                KUF0:   MFPI    R0              ;-(KSP)←(R1)
1283  005320  016704  172452                MOV     PSW,R4          ;SAVE CC'S
1284  005324  005037  177572                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1285  005330  122704  000005                CMPB    #Z+C,R4 ;CHECK CC'S
1286  005334  001401                        BEQ     .+4
1287  005336  000000                        HLT                     ;ERROR! INCORRECT CC'S
1288  005340  022706  001056                CMP     #KPTR-2,KSP     ;CHECK THAT STACK PTR WAS PUSHED
1289  005344  001401                        BEQ     .+4
1290  005346  000000                        HLT                     ;ERROR! INCORRECT STACK PTR
1291  005350  005716                        TST     (KSP)           ;CHECK RESULT
1292  005352  001401                        BEQ     .+4
1293  005354  000000                        HLT                     ;ERROR! INCORRECT RESULT
1294  005356  005067  172414                CLR     PSW
1295  005362  104000                        SCOPE
1296
1297                                ;TEST THAT MFPI CAN GET DATA FROM A KERNEL VIRTUAL ADDRESS
1298                                ;DM=1
1299  005364  012767  030000  172404        MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1300  005372  005066  177776                CLR     -2(KSP)
1301  005376  012702  120000                MOV     #VIRT,R2        ;R2=VIRTUAL ADDRESS
1302  005402  012737  177777  017200        MOV     #-1,@#PHYS      ;PRESET PHYSICAL ADDRESS
1303  005410  005237  177572                INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1304  005414  000277                        SCC                     ;PRESET CC'S
1305  005416  006512                KUF1:   MFPI    (R2)            ;-(KSP)←(R2)
1306  005420  016703  172352                MOV     PSW,R3          ;SAVE CC'S
1307  005424  005037  177572                CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1308  005430  122703  000011                CMPB    #N+C,R3         ;CHECK CC'S
1309  005434  001401                        BEQ     .+4
1310  005436  000000                        HLT                     ;ERROR! INCORRECT CC'S
1311  005440  022706  001056                CMP     #KPTR-2,KSP     ;CHECK THAT STACK WAS PUSHED
1312  005444  001401                        BEQ     .+4
1313  005446  000000                        HLT                     ;ERROR! INCORRECT STACK PTR
1314  005450  005216                        INC     (KSP)           ;CHECK RESULT
1315  005452  001401                        BEQ     .+4
1316  005454  000000                        HLT                     ;ERROR! INCORRECT RESULT
1317  005456  104000                        SCOPE
1318
1319                                ;DM=2
1320  005460  012767  030000  172310        MOV     #PUM,PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1321  005466  012766  177777  177776        MOV     #-1,-2(KSP)
1322  005474  012702  120000                MOV     #VIRT,R2        ;R2=VIRTUAL ADDRESS
```

```
1323  005500  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS
1324  005504  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1325  005510  006522                  KUF2:   MFPI    (R2)+           ;-(KSP)←VIRT
1326  005512  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1327  005516  005716                          TST     (KSP)           ;CHECK RESULT
1328  005520  001401                          BEQ     .+4
1329  005522  000000                          HLT                     ;ERROR! INCORRECT RESULT ON STACK
1330  005524  022702  120002                  CMP     #VIRT+2,R2      ;CHECK AUTO INCREMENT
1331  005530  001401                          BEQ     .+4
1332  005532  000000                          HLT                     ;ERROR! AUTO INCREMENT FAILED
1333  005534  005067  172236                  CLR     PSW
1334  005540  104000                          SCOPE
1335
1336                                  ;DM=3
1337  005542  012767  030000  172226          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1338  005550  005066  177776                  CLR     -2(KSP)
1339  005554  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
1340  005560  012737  120002  001004          MOV     #VIRT+2,@#TEMP  ;LOAD ADDRESS
1341  005566  012737  177777  017202          MOV     #-1,@#PHYS+2    ;PRESET DATA
1342  005574  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1343  005600  006532                  KUF3:   MFPI    @(R2)+          ;-(KSP)←VIRT+2
1344  005602  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1345  005606  005216                          INC     (KSP)           ;CHECK RESULT
1346  005610  001401                          BEQ     .+4
1347  005612  000000                          HLT                     ;ERROR! INCORRECT RESULT
1348  005614  104000                          SCOPE
1349
1350                                  ;DM=4
1351  005616  012767  030000  172152          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1352  005624  012766  177777  177776          MOV     #-1,-2(KSP)
1353  005632  012704  120002                  MOV     #VIRT+2,R4      ;R4=VIRTUAL ADDRESS+2
1354  005636  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
1355  005642  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1356  005646  006544                  KUF4:   MFPI    -(R4)           ;-(KSP)←VIRT
1357  005650  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1358  005654  022704  120000                  CMP     #VIRT,R4        ;CHECK AUTO-DECREMENT
1359  005660  001401                          BEQ     .+4
1360  005662  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
1361  005664  005716                          TST     (KSP)           ;CHECK RESULT
1362  005666  001401                          BEQ     .+4
1363  005670  000000                          HLT                     ;ERROR! INCORRECT RESULT
1364  005672  104000                          SCOPE
1365
1366                                  ;DM=5
1367  005674  012767  030000  172074          MOV     #PUM,PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1368  005702  005066  177776                  CLR     -2(KSP)
1369  005706  012701  001006                  MOV     #TEMP+2,R1      ;R1=INDIRECT ADDRESS
1370  005712  012737  120004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
1371  005720  012737  177777  017204          MOV     #-1,@#PHYS+4    ;PRESET PHYSICAL ADDRESS DATA
1372  005726  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1373  005732  006551                  KUF5:   MFPI    @-(R1)          ;-(KSP)←VIRT+4
1374  005734  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1375  005740  005216                          INC     (KSP)           ;CHECK RESULT
1376  005742  001401                          BEQ     .+4
1377  005744  000000                          HLT
1378  005746  005067  172024                  CLR     PSW
```

```
1379  005752  104000                          SCOPE
1380
1381                                  ;DM=6
1382  005754  012767  030000  172014          MOV     #PUM,PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1383  005762  012766  177777  177776          MOV     #-1,-2(KSP)
1384  005770  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
1385  005774  005037  017202                  CLR     @#PHYS+2        ;PRESET PHYSICAL ADDRESS DATA
1386  006000  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1387  006004  006562  120000          KUF6:   MFPI    VIRT(R2)        ;-(KSP)←VIRT-2
1388  006010  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1389  006014  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
1390  006020  001401                          BEQ     .+4
1391  006022  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
1392  006024  005716                          TST     (KSP)           ;CHECK RESULT
1393  006026  001401                          BEQ     .+4
1394  006030  000000                          HLT                     ;ERROR! INCORRECT RESULT
1395  006032  005067  171740                  CLR     PSW
1396  006036  104000                          SCOPE
1397
1398                                  ;DM=7
1399  006040  012767  030000  171730          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1400  006046  005066  177776                  CLR     -2(KSP)
1401  006052  012702  177774                  MOV     #-4,R2          ;LOAD INDEX REGISTER
1402  006056  012737  120000  001004          MOV     #VIRT,@#TEMP    ;LOAD ADDRESS
1403  006064  012737  177777  017200          MOV     #-1,@#PHYS      ;CLEAR PHYSICAL ADDRESS DATA
1404  006072  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1405  006076  006572  001010          KUF7:   MFPI    @TEMP+4(R2)     ;-(KSP)←VIRT
1406  006102  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1407  006106  005216                          INC     (KSP)           ;CHECK RESULT
1408  006110  001401                          BEQ     .+4
1409  006112  000000                          HLT                     ;ERROR! INCORRECT RESULT
1410  006114  104000                          SCOPE
1411
1412                                  ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
1413                                  ;DM=0,PC
1414  006116  012767  030000  171652          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1415  006124  005066  177776                  CLR     -2(KSP)
1416  006130  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1417  006134  000277                          SCC
1418  006136  006507                  KUF10:  MFPI    PC              ;-(KSP)←PC
1419  006140  016702  171632                  MOV     PSW,R2          ;SAVE CC'S
1420  006144  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1421  006150  122702  000001                  CMPB    #C,R2           ;CHECK CC'S
1422  006154  001401                          BEQ     .+4
1423  006156  000000                          HLT
1424  006160  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
1425  006164  001401                          BEQ     .+4
1426  006166  000000                          HLT                     ;ERROR! STACK NOT PUSHED
1427  006170  022716  006140                  CMP     #KUF10+2,(KSP)  ;CHECK THAT PC WAS PUSHED ON THE STACK
1428  006174  001401                          BEQ     .+4
1429  006176  000000                          HLT                     ;ERROR! PC NOT PUSHED ON THE STACK
1430  006200  104000                          SCOPE
1431
1432
1433
1434                                  ;DM=3,PC
```

```
1435  006202  012767  030000  171566          MOV     #PUM,PSW        ;KERNEL MODE!!!,PREV USER MODE!!
1436  006210  005066  177776                  CLR     -2(KSP)
1437  006214  012737  177777  017200          MOV     #-1,@#PHYS
1438  006222  005237  177572                  INC     @#SRO           ;ENABLE MEMORY MANAGEMENT
1439  006226  006537  120000          KUF11:  MFPI    @#VIRT          ;-(KSP)←VIRT
1440  006232  005037  177572                  CLR     @#SRO           ;DISABLE MEMORY MANAGEMENT
1441  006236  005216                          INC     (KSP)           ;CHECK RESULT
1442  006240  001401                          BEQ     .+4
1443  006242  000000                          HLT                     ;ERROR! INCORRECT RESULT
1444  006244  104000                          SCOPE
1445
1446                          ;DM=6,PC
1447  006246  012767  030340  171522          MOV     #PUM+PRTY7,PSW  ;KERNEL MODE!!!, PREV USER MODE!!
1448  006254  012766  177777  177776          MOV     #-1,-2(KSP)
1449  006262  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
1450  006266  005237  177572                  INC     @#SRO           ;ENABLE MEMORY MANAGEMENT
1451  006272  006567  111502          KUF12:  MFPI    VIRT            ;-(KSP)←VIRT
1452  006276  005037  177572                  CLR     @#SRO           ;DISABLE MEMORY MANAGEMENT
1453  006302  005716                          TST     (KSP)           ;CHECK RESULT
1454  006304  001401                          BEQ     .+4
1455  006306  000000                          HLT                     ;ERROR! INCORRECT RESULT
1456  006310  104000                          SCOPE
1457
1458                          ;DM=7,PC
1459  006312  012767  030000  171456          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1460  006320  005066  177776                  CLR     -2(KSP)
1461  006324  012737  120004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
1462  006332  012737  177777  017204          MOV     #-1,@#PHYS+4    ;PRESET DATA
1463  006340  005237  177572                  INC     @#SRO           ;ENABLE MEMORY MANAGEMENT
1464  006344  000277                          SCC
1465  006346  006577  172432          KUF13:  MFPI    @TEMP           ;-(KSP)←VIRT+4
1466  006352  016702  171420                  MOV     PSW,R2          ;SAVE CC'S
1467  006356  005037  177572                  CLR     @#SRO           ;DISABLE MEMORY MANAGEMENT
1468  006362  122702  000011                  CMPB    #N+C,R2         ;CHECK CC'S
1469  006366  001401                          BEQ     .+4
1470  006370  000000                          HLT                     ;ERROR! INCORRECT CC'S
1471  006372  005216                          INC     (KSP)           ;CHECK RESULT
1472  006374  001401                          BEQ     .+4
1473  006376  000000                          HLT                     ;ERROR! INCORRECT RESULT ON STACK
1474  006400  104000                          SCOPE
1475
1476  006402  012767  030000  171366          MOV     #KM+PUM,PSW     ;KERNEL MODE!!!,PREV USER MODE!!
1477  006410  012716  120000                  MOV     #VIRT,(KSP)
1478  006414  005037  017200                  CLR     @#PHYS
1479  006420  005237  177572                  INC     @#SRO           ;ENABLE MEMORY MANAGEMENT
1480  006424  006576  000000          KUF14:  MFPI    @(KSP)          ;-(KSP)←VIRT
1481  006430  005037  177572                  CLR     @#SRO           ;DISABLE MEMORY MANAGEMENT
1482  006434  005737  001056                  TST     @#KPTR-2        ;CHECK DATA ON THE STACK
1483  006440  001401                          BEQ     .+4
1484  006442  000000                          HLT                     ;ERROR! INCORRECT DATA ON THE STACK
1485  006444  104000                          SCOPE
1486
1487                          ;BEGIN TESTING IN USER MODE
1488                          ;NOTE: ALL HLT (HALT) INSTRUCTIONS WILL TRAP TO LOC 10. THE PROGRAM WILL
1489                          ;ALLOW THE TRAP,ADJUST THE PC AND RETURN TO THE HLT IN KERNEL MODE. THE
1490                          ;USER STACK POINTER IS NOT AFFECTED BY THIS TRAP. THE USER STACK POINTER
```

```
1491                                    ;IS AT PHYSICAL 0600.
1492
1493  006446  012706  000600            USRTST: MOV     #UPTR,USP       ;SET USER STACK PTR
1494  006452  000240                            NOP                     ;BEGIN TESTS IN USER MODE
1495  006454  012767  077406  171116            MOV     #77406,UPDR0    ;RW,UP 200 BLOCKS
1496  006462  012767  077406  171126            MOV     #77406,UPDR7    ;RW, UP 200 BLOCKS
1497  006470  012767  007600  171160            MOV     #7600,UPAR7
1498
1499                                    ;TESTS UU0-UU6 TEST THE MTPI INSTRUCTION IN USER MODE, PREV USER MODE.
1500                                    ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
1501  006476  012737  170340  177776            MOV     #UM+PUM+PRTY7,@#PSW     ;USER MODE!!!,PREV USER MODE!!
1502  006504  005016                            CLR     (USP)
1503  006506  012702  177777                    MOV     #-1,R2          ;PRESET REGISTER
1504  006512  005237  177572                    INC     @#SR0           ;ENABLE KT11
1505
1506  006516  006602                    UU0:    MTPI    R2              ;R2<-(USP)+
1507  006520  016703  171252                    MOV     PSW,R3          ;SAVE STATUS RESULT
1508  006524  005037  177572                    CLR     @#SR0           ;DISABLE KT11
1509  006530  022706  000602                    CMP     #UPTR+2,USP     ;CHECK THAT STACK POPPED
1510  006534  001401                            BEQ     .+4
1511  006536  000000                            HLT                     ;ERROR!  INCORRECT STACK PTR
1512  006540  122703  000344                    CMPB    #PRTY7+Z,R3     ;CHECK STATUS RESULT
1513  006544  001401                            BEQ     .+4
1514  006546  000000                            HLT                     ;ERROR! INCORRECT STATUS RESULT
1515  006550  005702                            TST     R2              ;CHECK RESULT
1516  006552  001401                            BEQ     .+4
1517  006554  000000                            HLT                     ;ERROR!  INCORRECT RESULT
1518  006556  104000                            SCOPE
1519
1520
1521                                    ;TEST THAT USER CAN LOAD USER ADDRESS (VIRT)
1522
1523                                    ;*********************************
1524          120000                            VIRT=120000     ;USER VIRTUAL ADDRESS FOR THESE TESTS
1525          017200                            PHYS=17200      ;CORRESPONDING PHYSICAL ADDRESS
1526                                    ;*********************************
1527
1528                                    ;DM=2
1529  006560  012737  170000  177776            MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
1530  006566  012716  177777                    MOV     #-1,(USP)
1531  006572  012702  120000                    MOV     #VIRT,R2        ;R2=VIRT ADDRESS
1532  006576  005037  017200                    CLR     @#PHYS          ;PRESET DATA
1533  006602  005237  177572                    INC     @#SR0           ;ENABLE KT11
1534
1535  006606  006622                    UU1:    MTPI    (R2)+           ;VIRT<-(USP)+
1536  006610  005037  177572                    CLR     @#SR0           ;DISABLE KT11
1537  006614  005237  017200                    INC     @#PHYS          ;CHECK RESULT
1538  006620  001401                            BEQ     .+4
1539  006622  000000                            HLT                     ;ERROR! INCORRECT RESULT
1540  006624  022702  120002                    CMP     #VIRT+2,R2      ;CHECK AUTO-INCREMENT
1541  006630  001401                            BEQ     .+4
1542  006632  000000                            HLT                     ;ERROR! AUTO-INCREMENT FAILED
1543  006634  005067  171136                    CLR     PSW
1544  006640  104000                            SCOPE
1545                                    ;DM=4
1546  006642  012737  170000  177776            MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
```

```
1547  006650  005016                          CLR     (USP)
1548  006652  012704  120002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
1549  006656  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET DATA
1550  006664  005237  177572                  INC     @#SR0           ;ENABLE KT11
1551
1552  006670  006644                  UU2:    MTPI    -(R4)           ;VIRT←(USP)+
1553  006672  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1554  006676  022704  120000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
1555  006702  001401                          BEQ     .+4
1556  006704  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
1557  006706  005737  017200                  TST     @#PHYS          ;CHECK RESULT
1558  006712  001401                          BEQ     .+4
1559  006714  000000                          HLT                     ;ERROR! INCORRECT RESULT
1560  006716  104000                          SCOPE
1561
1562                                  ;DM=6
1563  006720  012737  170000  177776          MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
1564  006726  005016                          CLR     (USP)
1565  006730  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
1566  006734  012767  177777  010240          MOV     #-1,PHYS+2      ;PRESET DATA
1567  006742  005237  177572                  INC     @#SR0           ;ENABLE KT11
1568
1569  006746  006662  120000          UU3:    MTPI    VIRT(R2)        ;VIRT+2←(USP)+
1570  006752  016700  171020                  MOV     PSW,R0          ;SAVE STATUS RESULT
1571  006756  005037  177572                  CLR     @#SR0           ;DISABLE KT11
1572  006762  022706  000602                  CMP     #UPTR+2,USP     ;CHECK THAT STACK POINTER POPPED
1573  006766  001401                          BEQ     .+4
1574  006770  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
1575  006772  122700  000004                  CMPB    #Z,R0   ;CHECK STATUS RESULT
1576  006776  001401                          BEQ     .+4
1577  007000  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
1578  007002  005737  017202                  TST     @#PHYS+2                ;CHECK RESULT
1579  007006  001401                          BEQ     .+4
1580  007010  000000                          HLT                     ;ERROR! INCORRECT RESULT
1581  007012  104000                          SCOPE
1582
1583                                  ;TEST THAT MTPI CAN LOAD PC
1584                                  ;DM=0,PC
1585  007014  012737  170000  177776          MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
1586  007022  012716  007036                  MOV     #UU4A,(USP)     ;PUT NEW PC ON STACK AS DATA
1587  007026  005237  177572                  INC     @#SR0           ;ENABLE KT11
1588
1589  007032  006607                  UU4:    MTPI    PC              ;PC←(USP)+
1590  007034  000000                          HLT                     ;ERROR! MTPI DID NOT LOAD PC
1591  007036  005037  177572          UU4A:   CLR     @#SR0           ;DISABLE KT11
1592  007042  104000                          SCOPE
1593
1594                                  ;DM=3,PC
1595  007044  012737  170000  177776          MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
1596  007052  012716  177777                  MOV     #-1,(USP)
1597  007056  005037  017200                  CLR     @#PHYS
1598  007062  005237  177572                  INC     @#SR0           ;ENABLE KT11
1599
1600  007066  006637  120000          UU5:    MTPI    @#VIRT          ;VIRT←(USP)+
1601  007072  016700  170700                  MOV     PSW,R0          ;SAVE STATUS RESULT
1602  007076  005037  177572                  CLR     @#SR0           ;DISABLE KT11
```

```
1603  007102  122700  000010          CMPB    #N,R0   ;CHECK STATUS RESULT
1604  007106  001401                  BEQ     .+4
1605  007110  000000                  HLT                     ;ERROR!  INCORRECT STATUS RESULT
1606  007112  005267  010062          INC     PHYS            ;CHECK RESULT
1607  007116  001401                  BEQ     .+4
1608  007120  000000                  HLT                     ;ERROR!  INCORRECT RESULT
1609  007122  005067  170650          CLR     PSW
1610  007126  104000                  SCOPE
1611
1612                          ;DM=7,PC
1613  007130  012737  170000  177776  MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
1614  007136  012716  177777          MOV     #-1,(USP)
1615  007142  012737  120004  001004  MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
1616  007150  005037  017204          CLR     @#PHYS+4        ;PRESET DATA
1617  007154  005237  177572          INC     @#SR0           ;ENABLE KT11
1618
1619  007160  006677  171620  UU6:    MTPI    @TEMP           ;VIRT+4+(USP)+
1620  007164  005037  177572          CLR     @#SR0           ;DISABLE KT11
1621  007170  005237  017204          INC     @#PHYS+4        ;CHECK RESULT
1622  007174  001401                  BEQ     .+4
1623  007176  000000                  HLT                     ;ERROR INCORRECT RESULT
1624  007200  104000                  SCOPE
1625                          ;TEST MFPI INSTRUCTION USER MODE PREVIOUS USER MODE
1626  007202  012767  170000  170566  MOV     #UM+PUM,PSW     ;USER MODE!!!,PREV USER MODE!!
1627  007210  012703  177777          MOV     #-1,R3          ;PRESET GENERAL REGISTER
1628  007214  005237  177572          INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1629  007220  006503          UUF0:   MFPI    R3              ;-(USP)+R3
1630  007222  016702  170550          MOV     PSW,R2          ;SAVE STATUS AFTER MFPI
1631  007226  005037  177572          CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1632  007232  022702  170010          CMP     #UM+PUM+N,R2    ;CHECK STATUS AFTER MFPI
1633  007236  001401                  BEQ     .+4
1634  007240  000000                  HLT                     ;ERROR! INCORRECT STATUS AFTER MFPI
1635  007242  022706  000576          CMP     #UPTR-2,USP     ;CHECK THAT STACK WAS PUSHED
1636  007246  001401                  BEQ     .+4
1637  007250  000000                  HLT                     ;ERROR! INCORRECT STACK PTR
1638  007252  005216                  INC     (USP)           ;CHECK RESULT
1639  007254  001401                  BEQ     .+4
1640  007256  000000                  HLT                     ;ERROR! INCORRECT RESULT
1641  007260  104000                  SCOPE
1642
1643                          ;TEST THAT MFPI CAN GET DATA FROM A USER VIRTUAL ADDRESS
1644                          ;DM=2
1645  007262  012767  170000  170506          MOV     #UM+PUM,PSW     ;USER MODE!!!,PREV USER MODE!!
1646  007270  012766  177777  177776          MOV     #-1,-2(USP)
1647  007276  012702  120000                  MOV     #VIRT,R2        ;R2=VIRTUAL ADDRESS
1648  007302  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS
1649  007306  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1650  007312  006522          UUF2:   MFPI    (R2)+           ;-(USP)+VIRT
1651  007314  005037  177572          CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1652  007320  005716                  TST     (USP)           ;CHECK RESULT
1653  007322  001401                  BEQ     .+4
1654  007324  000000                  HLT                     ;ERROR! INCORRECT RESULT ON STACK
1655  007326  022702  120002          CMP     #VIRT+2,R2      ;CHECK AUTO INCREMENT
1656  007332  001401                  BEQ     .+4
1657  007334  000000                  HLT                     ;ERROR! AUTO INCREMENT FAILED
1658  007336  005067  170434          CLR     PSW
```

```
1659  007342  104000                          SCOPE
1660
1661                                  ;DM=4
1662  007344  012767  170000  170424          MOV     #UM+PUM,PSW     ;USER MODE!!!,PREV USER MODE!!
1663  007352  012766  177777  177776          MOV     #-1,-2(USP)
1664  007360  012704  120002                  MOV     #VIRT+2,R4      ;R4=VIRTUAL ADDRESS+2
1665  007364  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
1666  007370  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1667  007374  006544                  UUF4:   MFPI    -(R4)           ;-(USP)←VIRT
1668  007376  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1669  007402  022704  120000                  CMP     #VIRT,R4        ;CHECK AUTO-DECREMENT
1670  007406  001401                          BEQ     .+4
1671  007410  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
1672  007412  005716                          TST     (USP)           ;CHECK RESULT
1673  007414  001401                          BEQ     .+4
1674  007416  000000                          HLT                     ;ERROR! INCORRECT RESULT
1675  007420  104000                          SCOPE
1676
1677                                  ;DM=6
1678  007422  012767  170000  170346          MOV     #UM+PUM,PSW     ;USER MODE!!!,PREV USER MODE!!
1679  007430  012766  177777  177776          MOV     #-1,-2(USP)
1680  007436  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
1681  007442  005037  017202                  CLR     @#PHYS+2        ;PRESET PHYSICAL ADDRESS DATA
1682  007446  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1683  007452  006562  120000          UUF6:   MFPI    VIRT(R2)        ;-(USP)←VIRT-2
1684  007456  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1685  007462  022706  000576                  CMP     #UPTR-2,USP     ;CHECK STACK PTR
1686  007466  001401                          BEQ     .+4
1687  007470  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
1688  007472  005716                          TST     (USP)           ;CHECK RESULT
1689  007474  001401                          BEQ     .+4
1690  007476  000000                          HLT                     ;ERROR! INCORRECT RESULT
1691  007500  005067  170272                  CLR     PSW
1692  007504  104000                          SCOPE
1693
1694                                  ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
1695                                  ;DM=3,PC
1696  007506  012767  170000  170262          MOV     #UM+PUM,PSW     ;USER MODE!!!,PREV USER MODE!!
1697  007514  005066  177776                  CLR     -2(USP)
1698  007520  012737  177777  017200          MOV     #-1,@#PHYS
1699  007526  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1700  007532  006537  120000          UUF11:  MFPI    @#VIRT          ;-(USP)←VIRT
1701  007536  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1702  007542  005216                          INC     (USP)           ;CHECK RESULT
1703  007544  001401                          BEQ     .+4
1704  007546  000000                          HLT                     ;ERROR! INCORRECT RESULT
1705  007550  104000                          SCOPE
1706
1707                                  ;DM=6,PC
1708  007552  012767  170340  170216          MOV     #UM+PUM+PRTY7,PSW       ;USER MODE!!! PREV USER MODE!!
1709  007560  012766  177777  177776          MOV     #-1,-2(USP)
1710  007566  005037  017200                  CLR     @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
1711  007572  005237  177572                  INC     @#SR0           ;ENABLE MEMORY MANAGEMENT
1712  007576  006567  110176          UUF12:  MFPI    VIRT            ;-(USP)←VIRT
1713  007602  005037  177572                  CLR     @#SR0           ;DISABLE MEMORY MANAGEMENT
1714  007606  005716                          TST     (USP)           ;CHECK RESULT
```

```
1715  007610  001401                          BEQ     .+4
1716  007612  000000                          HLT                     ;ERROR! INCORRECT RESULT
1717  007614  104000                          SCOPE
1718
1719                                  ;************************IMPORTANT NOTE************************
1720                                  ;NO CODE ALLOWED BETWEEN 16600-17776
1721  007616  005067  170154          END:    CLR     PSW
1722  007622  005767  171170                  TST     PASCNT          ;FIRST PASS?
1723  007626  001410                          BEQ     DONE            ;YES, SKIP ITERATIONS THIS TIME
1724  007630  005267  171144                  INC     ICNT            ;INCREMENT PASS COUNT
1725  007634  026727  171140  001000          CMP     ICNT,#1000
1726  007642  001402                          BEQ     DONE
1727  007644  000167  171342                  JMP     BEGIN
1728  007650  005267  171142          DONE:   INC     PASCNT          ;TO ENABLE ITERATIONS ON LATER PASSES
1729  007654  012767  000007  167704          MOV     #7,TPB          ;RING BELL
1730  007662  105767  167676                  TSTB    TPS
1731  007666  100375                          BPL     .-4
1732  007670  012767  000052  167670          MOV     #52,TPB         ;PRINT '*' FOR PASS INDICATION
1733  007676  105767  167662                  TSTB    TPS
1734  007702  100375                          BPL     .-4
1735  007704  012767  000177  167654          MOV     #177,TPB        ;OUTPUT NULL CHARACTER
1736  007712  105767  167646                  TSTB    TPS
1737  007716  100375                          BPL     .-4
1738  007720  013702  000042                  MOV     @#42,R2         ;MONITOR LOAD?
1739  007724  001405                          BEQ     DONE1           ;NO, CONTINUE
1740  007726  000005                          RESET
1741  007730  004712                  $ENDAD: JSR     7,(2)           ;RETURN TO MONITOR
1742  007732  000240                          NOP
1743  007734  000240                          NOP
1744  007736  000240                          NOP
1745  007740  000167  171124          DONE1:  JMP     START           ;RESTART
1746
1747          000001                          .END
```

```
BEGIN   001212          KK12    002320          KUF10   006136          PASCNT  001016          UPAR7 = 177656
C     = 000001          KK13    002404          KUF11   006226          PFVEC = 000024          UPDR0 = 177600
DISPLA= 177570          KK14    002440          KUF12   006272          PHYS  = 017200          UPDR1 = 177602
DONE    007650          KK15    002534          KUF13   006346          PRTY4 = 000200          UPDR2 = 177604
DONE1   007740          KK16    002572          KUF14   006424          PRTY7 = 000340          UPDR3 = 177606
EMTVEC= 000030          KK2     001606          KUF2    005510          PSW   = 177776          UPDR4 = 177610
END     007616          KK3     001670          KUF3    005600          PUM   = 030000          UPDR5 = 177612
ERRVEC= 000010          KK4     001730          KUF4    005646          RW    = 000006          UPDR6 = 177614
FTITLE  001014          KK5     002014          KUF5    005732          SCOPE = 104000          UPDR7 = 177616
HLT   = 000000          KK6     002066          KUF6    006004          SCOPEA  000432          UPTR  = 000600
ICNT    001000          KK7     002162          KUF7    006076          SHLT    000400          USP   =%000006
KKF0    002720          KM    = 000000          KU0     002634          SHLTA   000422          USRTST  006452
KKF1    003012          KPAR0 = 172340          KU1     004054          SLR   = 177774          UUF0    007220
KKF10   003526          KPAR1 = 172342          KU10    004602          SR0   = 177572          UUF11   007532
KKF11   003616          KPAR2 = 172344          KU10A   004606          SR1   = 177574          UUF12   007576
KKF12   003662          KPAR3 = 172346          KU11    004640          SR2   = 177576          UUF2    007312
KKF13   003734          KPAR4 = 172350          KU11A   004646          SSROT   001002          JUF4    007374
KKF14   004002          KPAR5 = 172352          KU12    004714          START   001070          UUF6    007452
KKF14A  004004          KPAR6 = 172354          KU13    005004          TEMP    001004          UU0     006516
KKF2    003104          KPAR7 = 172356          KU13A   005010          TITLE   001146          UU1     006606
KKF3    003172          KPDR0 = 172300          KU14    005054          TKB   = 177562          UU2     006670
KKF4    003236          KPDR1 = 172302          KU15    005152          TKS   = 177560          UU3     006746
KKF5    003322          KPDR2 = 172304          KU16    005226          TPB   = 177566          UU4     007032
KKF6    003374          KPDR3 = 172306          KU2     004146          TPS   = 177564          UU4A    007036
KKF7    003464          KPDR4 = 172310          KU3     004234          UM    = 140000          UU5     007066
KK0     001430          KPDR5 = 172312          KU4     004302          UPAR0 = 177640          UU6     007160
KK1     001514          KPDR6 = 172314          KU5     004366          UPAR1 = 177642          VIRT  = 120000
KK10    002220          KPDR7 = 172316          KU6     004440          UPAR2 = 177644          Z     = 000004
KK10A   002222          KPTR  = 001060          KU7     004542          UPAR3 = 177646          $ENDAD  007730
KK10B   002204          KSP   =%000006          MMERR   000462          UPAR4 = 177650          .     = 007744
KK11    002254          KUF0    005316          MMVEC = 000250          UPAR5 = 177652
KK11A   002256          KUF1    005416          N     = 000010          UPAR6 = 177654

. ABS.  007744      000


 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 MULE:DBKTCB,MULE:D3KTCB/SOL=DSKZ:SYSMAC.SML,MULE:DBKTCB.P11
 RUN-TIME: 7 9 .1 SECONDS
 RUN-TIME RATIO: 91/16=5.4
 CORE USED:  31K  (61 PAGES)
```