KT11-C

MTPD/I

MD-11-DCKTD-A

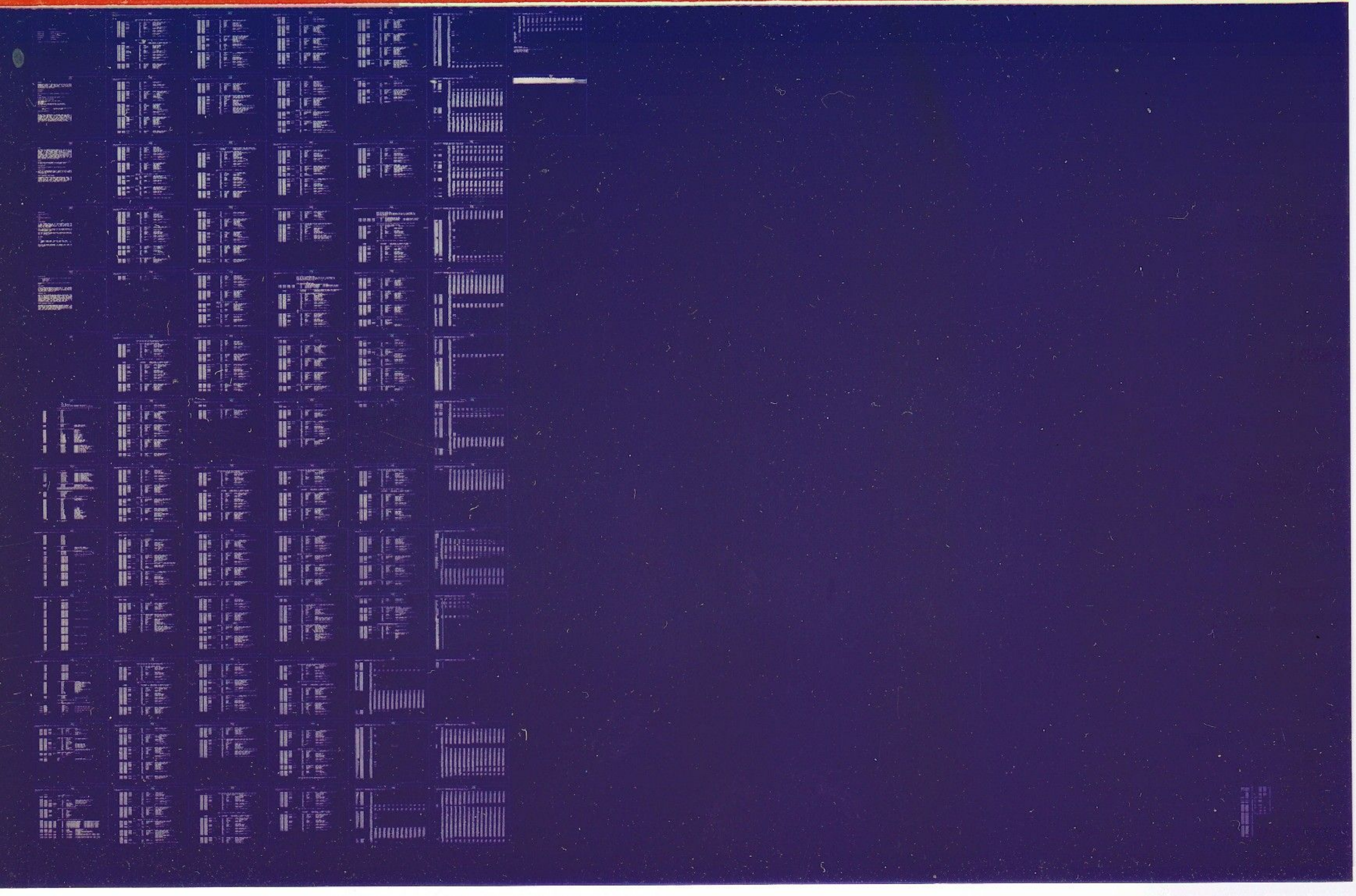
EP-DCKTD-A-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN USA



IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DCKTD-A-D
PRODUCT NAME: MTPD/I WITH MEMORY MANAGEMENT
DATE CREATED: 15 MARCH 1972
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: JOHN ADAMS

1.0 ABSTRACT

PROGRAM DCKTD TESTS THE MTPD AND MTPI INSTRUCTIONS WITH MEMORY MANAGEMENT ENABLED. (SEE PROG DCKBO FOR TESTS OF THESE INSTRUCTIONS WITHOUT MEMORY MANAGEMENT. THESE INSTRUCTIONS ARE EXECUTED IN ALL COMBINATIONS OF CURRENT MODES AND EQUAL OR LOWER HEIRARCHY PREVIOUS MODES.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/45 WITH KT11-C (MEMORY MANAGEMENT) OPTION INSTALLED

2.2 STORAGE

PROGRAM STORAGE - THE ROUTINE USES MEMORY 0-17777

3.0 LOADING AND STARTING PROCEDURE

LOAD PROGRAM INTO MEMORY USING ABS LOADER
LOAD ADDRESS 200
PRESS START.
THE PROGRAM WILL LOOP AND RING BELL ON COMPLETION.
PASS COUNT MAY BE MONITORED IN THE DISPLAY REGISTER.

4.0 SWITCH SETTINGS

SW8 = 1 OR UP .... LOAD PDP11/45 MICRO BREAK REGISTER
SW7-SW0..... VALUE TO BE LOADED

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 4 IN SUPERVISORY/ 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 SUPERVISORY/USER STACK POINTERS ARE 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. THE SCOPE ROUTINE ALSO CONTAINS INSTRUCTIONS TO LOAD THE MICRO BREAK REGISTER (SEE SEC 4.0 FOR SWITCH SETTINGS). 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 SRD IN LOCATION SSROT, CLEARS SRD, 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).

NOTE: THE PDP11/45 WILL DISPLAY THE TRAP VECTOR ADDRESS+4 IN THE ADDRESS LIGHTS. THUS A TRAP TO 4 (BUS ERROR) WILL DISPLAY 10 IN THE ADDRESS LIGHTS.

8.1 NOTE THAT THE PROGRAM TAGS EACH MTPD/I INSTRUCTION UNDER TEST. THE TAG DENOTES CURRENT SPACE, 'PREVIOUS' SPACE AND WHETHER MTPD/I. FOR EXAMPLE:

1) KUI4:
2) SSI7:

DENOTE:

1) 'CURRENT' KERNEL MODE, 'PREVIOUS' USER MODE, MTPD
2) 'CURRENT' SUPERVISOR MODE, 'PREVIOUS' SUPERVISOR MODE, MTPI

NOTE ALSO THAT MEMORY MANAGEMENT IS ENABLED ONLY WHEN THE MTPD/I 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
SUPERVISOR = 700
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 AT THE TTY. THE PASS COUNT MAY BE OBSERVED BY TURNING THE SWITCH TO THE DISPLAY POSITION. THE PASS COUNT SHOULD BE MONITORED IN THE EVENT THAT THE PROGRAM ENTERS AN UNDEFINED LOOP.

8.4 DEBUGGING TIPS

WHEN THE FAILING SUBTEST HAS BEEN ISOLATED, REPLACE THE FIRST WORD OF THE MTPD/I 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. THIS MAP IS CHANGED TWICE, WHEN THE PROGRAM BEGINS TESTS IN SUPERVISORY MODE, AND AGAIN WHEN THE PROGRAM BEGINS TESTS AT USER MODE. THE USER SHOULD ACQUAINT HIMSELF WITH THE MEMORY MANAGEMENT MAP BEFORE USING THIS PROGRAM.

```
231                                     .ABS
232                                     .LIST   ME
                                        .NLIST  SEQ,MD,MC
                                        .TITLE  PDP11/45 MEMORY MANAGEMENT TEST DCKTD-A
                                        ;COPYRIGHT 1972. DIGITAL EQUIPMENT COPORATION, MAYNARD,MASS

                                ;THIS TEST TESTS THE MTPI & MTPD INSTRUCTIONS WITH MEMORY MANAGEMENT ENABLED.

                                ;GENERAL REGISTER ASSIGNMENTS
000000                                  R0=%0
000001                                  R1=%1
000002                                  R2=%2
000003                                  R3=%3
000004                                  R4=%4
000005                                  R5=%5
000007                                  PC=%7
000000                                  R10=%0
000001                                  R11=%1
000002                                  R12=%2
000003                                  R13=%3
000004                                  R14=%4
000005                                  R15=%5

                                ;STACK POINTER REGISTERS
000006                                  KSP=%6                  ;KERNEL STACK POINTER
000006                                  SSP=%6                  ;SUPERVISOR STACK POINTER
000006                                  USP=%6                  ;USER STACK POINTER

                                ;STATUS REGISTER BIT ASSIGNMENTS
000001                                  C=1                     ;CARRY BIT
000002                                  V=2                     ;OVERFLOW BIT
000004                                  Z=4                     ;ZERO BIT
000010                                  N=10                    ;NEGATIVE BIT
000020                                  T=20                    ;'T' BIT
000340                                  PRTY7=340               ;PRIORITY LEVEL 7
000200                                  PRTY4=200               ;PRIORITY LEVEL 4
004000                                  REG=4000                ;SELECTS R10-R15
000000                                  KM=000000               ;KERNEL MODE
040000                                  SM=040000               ;SUPERVISORY MODE
140000                                  UM=140000               ;USER MODE
000000                                  PKM=000000              ;PREVIOUS KERNEL MODE
010000                                  PSM=010000              ;PREVIOUS SUPERVISORY MODE
030000                                  PUM=030000              ;PREVIOUS USER MODE
004000                                  REG=004000              ;SELECT R10-R15

                                ;VECTOR ADDRESSES
000004                                  ERRVEC=4                ;ADDRESS OF ERROR VECTOR
000010                                  RESVEC=10               ;ADDRESS OF RESERVED INST TRAP VECTOR
000014                                  TBITVEC=14              ;ADDRESS OF 'T' BIT TRAP VECTOR
000020                                  IOTVEC=20               ;ADDRESS OF IOT TRAP VECTOR
000024                                  PFVEC=24                ;ADDRESS OF POWER FAIL TRAP VECTOR
000030                                  EMTVEC=30               ;ADDRESS OF EMT VECTOR
000034                                  TRAPVEC=34              ;ADDRESS OF TRAP VECTOR
000064                                  TPVEC=64                ;ADDRESS OF TTY PRINTER INTERRUPT VECTOR
000240                                  PIRVEC=240              ;ADDRESS CF PIRQ VECTOR
```

```
000250                          MMVEC=250               ;ADDRESS OF MEM MGMT ERROR TRAP VECTOR

                        ;REGISTER ADDRESSES
177776                          PSW=177776              ;ADDRESS OF STATUS REGISTER
177774                          SLR=177774              ;ADDRESS OF STACK LIMIT REGISTER
177772                          PIRQ=177772             ;ADDRESS OF PROGRAM INTERRUPT REQUEST
177770                          UBREAK=177770           ;ADDRESS OF MICRO BREAK 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                          SWR=177570              ;ADDRESS OF CONSOL SWITCH REGISTER
177570                          LIGHTS=177570           ;ADDRESS OF CONSOL LIGHT REGISTER

                        ;INITIAL STACK POINTER SETTINGS
001060                          KPTR=1060               ;BOTTOM OF KERNEL STACK
000700                          SPTR=700                ;SUPERVISORY STACK SETTING
000600                          UPTR=600                ;USER STACK SETTING
                        ;*****************************NOTE*********************************
                        ;THE KERNEL,SUPERVISOR & USER STACK POINTER ARE AT PHYSICAL 1060,0700 & 0600
                        ;******************************************************************

                        ;MISCELLANEOUS BIT ASSIGNMENTS
100000                          BIT15=100000
040000                          BIT14=40000
020000                          BIT13=20000
000400                          BIT8=400
000100                          BIT6=100
010000                          PIR4=10000              ;LEVEL 4 PROGRAM INT. RQST.

                        ;MEMORY MANAGEMENT REGISTER SR0 BIT ASSIGNMENTS
000001                          ENMM=1                  ;ENABLE MEMORY MANAGEMENT
000000                          VP0=0                   ;VIRTUAL PAGE 0
000002                          VP1=2                   ;     "       "   1
000004                          VP2=4                   ;     "       "   2
000006                          VP3=6                   ;     "       "   3
000010                          VP4=10                  ;     "       "   4
000012                          VP5=12                  ;     "       "   5
000014                          VP6=14                  ;     "       "   6
000016                          VP7=16                  ;     "       "   7
000020                          DS=20                   ;'D' SPACE
000000                          IS=00                   ;'I' SPACE
000140                          UPG=140                 ;USER PAGE
000040                          SPG=40                  ;SUPERVISOR PAGE
000000                          KPG=000                 ;KERNEL PAGE
000200                          IC=200                  ;INSTRUCTION COMPLETE
000400                          DM=400                  ;DESTINATION MODE
001000                          TE=1000                 ;TRAP ENABLE
004000                          OST=4000                ;OST ABORT FLAG
010000                          MMT=10000               ;MEMORY MANAGEMENT TRAP
020000                          AVA=20000               ;ACCESS VIOLATION ABORT
040000                          PLA=40000               ;PAGE LENGTH ABORT
100000                          NRA=100000              ;NON-RESIDENT ABORT

                        ;SR1 BIT ASSIGNMENTS
000010                          INC1=10
```

```
000020                          INC2=20
000370                          DEC1=370
000360                          DEC2=360
000000                          DR0=000
000400                          DR1=400
001000                          DR2=1000
001400                          DR3=1400
002000                          DR4=2000
002400                          DR5=2400
003000                          DR6=3000
003400                          DR7=3400

                        ;SR3 BIT ASSIGNMENTS
000001                          UDE=1                   ;USER 'D' SPACE ENABLE
000002                          SDE=2                   ;SUPERVISOR 'D' SPACE ENABLE
000004                          KDE=4                   ;KERNEL 'D' SPACE ENABLE

                        ;MEMORY MANAGEMENT REGISTER ADDRESS ASSIGNMENTS
177572                          SR0=177572              ;ADDRESS OF MEM MGMT REGISTER SR0
177574                          SR1=177574              ;    "    "    "        "    SR1
177576                          SR2=177576              ;    "    "    "        "    SR2
172516                          SR3=172516              ;ADDRESS OF MEM MGMT REGISTER SR3

177600                          UIPDR0=177600           ;USER 'I' SPACE PDR'S
177602                          UIPDR1=177602
177604                          UIPDR2=177604
177606                          UIPDR3=177606
177610                          UIPDR4=177610
177612                          UIPDR5=177612
177614                          UIPDR6=177614
177616                          UIPDR7=177616

177620                          UDPDR0=177620           ;USER 'D' SPACE PDR'S
177622                          UDPDR1=177622
177624                          UDPDR2=177624
177626                          UDPDR3=177626
177630                          UDPDR4=177630
177632                          UDPDR5=177632
177634                          UDPDR6=177634
177636                          UDPDR7=177636

177640                          UIPAR0=177640           ;USER 'D' SPACE PAR'S
177642                          UIPAR1=177642
177644                          UIPAR2=177644
177646                          UIPAR3=177646
177650                          UIPAR4=177650
177652                          UIPAR5=177652
177654                          UIPAR6=177654
177656                          UIPAR7=177656

177660                          UDPAR0=177660           ;USER 'I' SPACE PAR'S
177662                          UDPAR1=177662
177664                          UDPAR2=177664
177666                          UDPAR3=177666
177670                          UDPAR4=177670
177672                          UDPAR5=177672
```

```
177674                  UDPAR6=177674
177676                  UDPAR7=177676

172200                  SIPDR0=172200           ;SUPERVISOR 'I' SPACE PDR'S
172202                  SIPDR1=172202
172204                  SIPDR2=172204
172206                  SIPDR3=172206
172210                  SIPDR4=172210
172212                  SIPDR5=172212
172214                  SIPDR6=172214
172216                  SIPDR7=172216

172220                  SDPDR0=172220           ;SUPERVISOR 'D' SPACE PDR'S
172222                  SDPDR1=172222
172224                  SDPDR2=172224
172226                  SDPDR3=172226
172230                  SDPDR4=172230
172232                  SDPDR5=172232
172234                  SDPDR6=172234
172236                  SDPDR7=172236

172240                  SIPAR0=172240           ;SUPERVISOR 'I' SPACE PAR'S
172242                  SIPAR1=172242
172244                  SIPAR2=172244
172246                  SIPAR3=172246
172250                  SIPAR4=172250
172252                  SIPAR5=172252
172254                  SIPAR6=172254
172256                  SIPAR7=172256

172260                  SDPAR0=172260           ;SUPERVISOR 'D' SPACE PAR'S
172262                  SDPAR1=172262
172264                  SDPAR2=172264
172266                  SDPAR3=172266
172270                  SDPAR4=172270
172272                  SDPAR5=172272
172274                  SDPAR6=172274
172276                  SDPAR7=172276

172300                  KIPDR0=172300           ;KERNEL 'I' SPACE PDR'S
172302                  KIPDR1=172302
172304                  KIPDR2=172304
172306                  KIPDR3=172306
172310                  KIPDR4=172310
172312                  KIPDR5=172312
172314                  KIPDR6=172314
172316                  KIPDR7=172316

172320                  KDPDR0=172320           ;KERNEL 'D' SPACE PDR'S
172322                  KDPDR1=172322
172324                  KDPDR2=172324
172326                  KDPDR3=172326
172330                  KDPDR4=172330
172332                  KDPDR5=172332
172334                  KDPDR6=172334
172336                  KDPDR7=172336
```

```
                    172340                  KIPAR0=172340           ;KERNEL 'I' SPACE PAR'S
                    172342                  KIPAR1=172342
                    172344                  KIPAR2=172344
                    172346                  KIPAR3=172346
                    172350                  KIPAR4=172350
                    172352                  KIPAR5=172352
                    172354                  KIPAR6=172354
                    172356                  KIPAR7=172356

                    172360                  KDPAR0=172360           ;KERNEL 'D' SPACE PAR'S
                    172362                  KDPAR1=172362
                    172364                  KDPAR2=172364
                    172366                  KDPAR3=172366
                    172370                  KDPAR4=172370
                    172372                  KDPAR5=172372
                    172374                  KDPAR6=172374
                    172376                  KDPAR7=172376

                                    ;ACCESS CONTROL FIELD DEFINITIONS (IN PDR)
                    000000                  NR0=0                   ;NON-RESIDENT ABORT ALL REFS.
                    000001                  RDOT=1                  ;TRAP ON READ,ABORT ON WRITE
                    000002                  RDO=2                   ;READ,ABORT ON WRITE
                    000003                  NR3=3                   ;UNUSED ABORT ALL
                    000004                  RWT=4                   ;TRAP ON READ & WRITE
                    000005                  RWTW=5                  ;READ,TRAP ON WRITE
                    000006                  RW=6                    ;READ & WRITE
                    000007                  NR7=7                   ;ABORT ALL
                    000010                  ED=10                   ;EXPANSION DIRECTION BIT INPDR
                    000000                  UP=0                    ;EXPAND UP
                    000010                  DWN=10                  ;EXPAND DOWN
                    000200                  ABIT=200                ;'A' BIT
                    000100                  WBIT=100                ;'W' BIT

                                    ;INSTUCTION EQUATES
                    000240                  NOP=240
                    000000                  HLT=HALT
                    104000                  SCOPE=EMT               ;SCOPE IS AN EMT TRAP INST.

                                    ;LOAD TRAP/INTERRUPT VECTOR AREA WITH
                                    ;       .+2
                                    ;       HALT
                                    ;CAUSES UNEXPECTED TRAPS/INTERRUPTS TO HALT AT VECTOR ADDRESS +2
                                            .NLIST  MC,MD,SEQ

                    000004                  .=ERRVEC
000004  000400                              .WORD   SHLT            ;SET SUPER AND USER HALT TRAP
                    000030                  .=EMTVEC
000030  000432                              .WORD   SCOPEA          ;SET SCOPE (EMT) TRAP VECTOR
                    000250                  .=MMVEC
000250  000512                              .WORD   MMERR           ;SET MEM MGMT ERROR TRAP VECTOR
                    000200                  .=200
000200  000167  000664                      JMP     START           ;GO START TEST

                    000400                  .=400
```

```
                                        ;SUPER/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  000006                          RTT                     ;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  000700                  MOV     #SPTR,-(KSP)
000450  012746  000600                  MOV     #UPTR,-(KSP)
000454  012737  030000  177776          MOV     #PUM,@#PSW      ;PREVIOUS USER MODE
000462  106606                          MTPD    USP             ;SET USER STACK PTR
000464  006237  177776                  ASR     @#PSW           ;PREVIOUS SUPER MODE
000470  106606                          MTPD    SSP             ;SET SUPER STACK PTR
000472  032737  000400  177570          BIT     #BIT8,@#SWR     ;LOAD MICRO BREAK?
000500  001403                          BEQ     SCOPEX
000502  113737  177570  177770          MOVB    @#SWR,@#UBREAK  ;LOAD SR0-SR7 INTO MICRO BREAK REG.
000510  000006                SCOPEX: RTT                     ;RETURN & START NEXT TEST

                                        ;MEMORY MANAGEMENT ERROR SERVICE
000512  013767  177572  000262  MMERR:  MOV     @#SR0,SROT      ;SAVE SR0
000520  005067  177046                  CLR     SR0
000524  000137  000252                  JMP     @#MMVEC+2

        001000                          .=1000
                                ;TAGS
001000  000000                  ICNT:   0                       ;CONTAINS PASS COUNT
001002  000000                  SROT:   0                       ;CONTAINS SR0 CONTENTS ON ERROR
001004  000000                  TEMP:   0
        001014                          .=.+6
```

```
                001070                          .=1070
                                        ;START MEMORY MANAGEMENT TEST
001070  000240                         START:  NOP
001072  005067  177702                        CLR     ICNT                    ;CLEAR PASS COUNT

001076                                  BEGIN:
001076  005037  177776                        CLR     @#PSW                   ;KERNEL MODE!!! PREV KERNEL MODE!!
001102  012706  001060                        MOV     #KPTR,KSP               ;SET KERNEL STACK PTR
001106  104000                                SCOPE                           ;SCOPE SETS UP ALL STACK PTRS
001110  012737  000400  177774                MOV     #400,@#SLR              ;SET STACK LIMIT=1000
001116  016767  177656  176444                MOV     ICNT,LIGHTS             ;DISPLAY PASS COUNT
001124  012737  000512  000250                MOV     #MMERR,@#MMVEC
001132  005037  000252                        CLR     @#MMVEC+2               ;KERNEL MODE ON MEM MGMT ABORT
001136  012737  000007  172516                MOV     #KDE+SDE+UDE,@#SR3

                                        ;ROUTINE TO CLEAR MEM MGMT REGISTERS.
001144  000240                         MMO:    NOP
001146  005067  176420                        CLR     SR0
001152  012702  177600                        MOV     #UIPDR0,R2
001156  012703  000040                        MOV     #40,R3
001162  005022                                CLR     (R2)+
001164  077302                                SOB     R3,.-2
001166  012702  172200                        MOV     #SIPDR0,R2
001172  012703  000100                        MOV     #100,R3
001176  005022                                CLR     (R2)+
001200  077302                                SOB     R3,.-2

                                        ;ROUTINE TO SET UP MEM MGMT REGISTERS FOR TESTS
001202                                  MMK:
001202  012737  073006  172300                MOV     #167*400-400+UP+RW,@#KIPDR0     ;LOAD KIPDR0 RW,UP 167 BLOCKS
001210  012737  004006  172320                MOV     #11*400-400+UP+RW,@#KDPDR0      ;LOAD KDPDR0 RW,UP 11 BLOCKS
001216  012737  000006  172334                MOV     #1*400-400+UP+RW,@#KDPDR6       ;LOAD KDPDR6 RW,UP 1 BLOCKS
001224  012737  077406  172336                MOV     #200*400-400+UP+RW,@#KDPDR7     ;LOAD KDPDR7 RW,UP 200 BLOCKS
001232  012737  000006  172222                MOV     #1*400-400+UP+RW,@#SDPDR1       ;LOAD SDPDR1 RW,UP 1 BLOCKS
001240  012737  000006  172204                MOV     #1*400-400+UP+RW,@#SIPDR2       ;LOAD SIPDR2 RW,UP 1 BLOCKS
001246  012737  000006  177630                MOV     #1*400-400+UP+RW,@#UDPDR4       ;LOAD UDPDR4 RW,UP 1 BLOCKS
001254  012737  000006  177612                MOV     #1*400-400+UP+RW,@#UIPDR5       ;LOAD UIPDR5 RW,UP 1 BLOCKS

001262  005067  171052                        CLR     KIPAR0          ;VA=PA=0000-16677
001266  005067  171066                        CLR     KDPAR0          ;VA=PA=0-1077
001272  012767  000167  171074                MOV     #167,KDPAR6     ;VA=140000-140077;PA=16700-16777
001300  012767  007600  171070                MOV     #7600,KDPAR7    ;VA=160000-177776,PA=760000-777776
                                                                        ;(I/O PAGE)
001306  012767  000170  170730                MOV     #170,SIPAR2     ;VA=40000-40077/PA=17000-17077 (SUPER I SPACE)
001314  012767  000171  170740                MOV     #171,SDPAR1     ;VA=20000-20077/PA=17100-17177 (SUPER D SPACE)

001322  012767  000172  176322                MOV     #172,UIPAR5     ;VA=120000-120077/PA=17200-17277 (USER I SPACE)
001330  012767  000173  176332                MOV     #173,UDPAR4     ;VA=100000-100077/PA=17300-17377 (USER D SPACE)
```

```
                                        ;TESTS KK0-KK15 TEST THE MTPD INSTRUCTION IN KERNEL MODE, PREV KERNEL MODE.
                                        ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)
001336                                  TOA:
001336  012737  000340  177776                  MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
001344  005016                                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
001346  012702  177777                          MOV     #-1,R2          ;PRESET REGISTER
001352  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
001356  106602                        KK0:      MTPD    R2              ;R2+(KSP)+
001360  013703  177776                          MOV     @#PSW,R3                ;SAVE STATUS RESULT
001364  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
001370  022706  001062                          CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
001374  001401                                  BEQ     .+4
001376  000000                                  HLT                     ;ERROR!  INCORRECT STACK PTR
001400  122703  000344                          CMPB    #PRTY7+Z,R3     ;CHECK STATUS RESULT
001404  001401                                  BEQ     .+4
001406  000000                                  HLT                     ;ERROR! INCORRECT STATUS RESULT
001410  005702                                  TST     R2              ;CHECK RESULT
001412  001401                                  BEQ     .+4
001414  000000                                  HLT                     ;ERROR!  INCORRECT RESULT
001416  104000                                  SCOPE

                                        ;TEST THAT KERNEL CAN LOAD KERNEL VIRTUAL 'D' ADDRESS (VIRT)
                                        ;DM=1

        140000                                  VIRT=140000     ;KERNEL VIRTUAL 'D' ADDRESS FOR THESE TESTS
        016700                                  PHYS=16700      ;CORRESPONDING PHYSICAL 'D' ADDRESS

001420  005016                                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
001422  012702  140000                          MOV     #VIRT,R2        ;R2=VIRT ADDRESS
001426  012737  177777  016700                  MOV     #-1,@#PHYS      ;PRESET DATA
001434  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
001440  000277                                  SCC
001442  106612                        KK1:      MTPD    (R2)            ;VIRT+(KSP)+
001444  013703  177776                          MOV     @#PSW,R3                ;SAVE STATUS RESULT
001450  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
001454  022706  001062                          CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
001460  001401                                  BEQ     .+4
001462  000000                                  HLT                     ;ERROR! INCORRECT STACK PTR
001464  122703  000005                          CMPB    #Z+C,R3         ;CHECK STATUS RESULT
001470  001401                                  BEQ     .+4
001472  000000                                  HLT                     ;ERROR! INCORRECT STATUS RESULT
001474  005737  016700                          TST     @#PHYS          ;CHECK RESULT
001500  001401                                  BEQ     .+4
001502  000000                                  HLT                     ;ERROR! INCORRECT RESULT
001504  104000                                  SCOPE

                                        ;DM=2
001506  012737  004000  177776                  MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
001514  012716  177777                          MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
001520  012702  140000                          MOV     #VIRT,R12       ;R12=VIRT ADDRESS
001524  005037  016700                          CLR     @#PHYS          ;PRESET DATA
001530  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
001534  106622                        KK2:      MTPD    (R12)+          ;VIRT+(KSP)+
```

```
001536  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
001542  005237  016700                  INC     @#PHYS          ;CHECK RESULT
001546  001401                          BEQ     .+4
001550  000000                          HLT                     ;ERROR! INCORRECT RESULT
001552  022702  140002                  CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
001556  001401                          BEQ     .+4
001560  000000                          HLT                     ;ERROR! AUTO-INCREMENT FAILED
001562  005037  177776                  CLR     @#PSW
001566  104000                          SCOPE
                        ;DM=3
001570  012737  000340  177776          MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
001576  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
001602  012702  140000                  MOV     #VIRT,R2                ;LOAD INDIRECT ADDRESS
001606  012737  140004  016700          MOV     #VIRT+4,@#PHYS  ;LOAD ADDRESS
001614  005037  016704                  CLR     @#PHYS+4                ;PRESET DATA
001620  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
001624  106632              KK3:        MTPD    @(R2)+          ;VIRT+4+(KSP)+
001626  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
001632  005237  016704                  INC     @#PHYS+4                ;CHECK RESULT
001636  001401                          BEQ     .+4
001640  000000                          HLT                     ;ERROR! INCORRECT RESULT
001642  104000                          SCOPE

                        ;DM=4
001644  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
001646  012704  140002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
001652  012737  177777  016700          MOV     #-1,@#PHYS      ;PRESET DATA
001660  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
001664  106644              KK4:        MTPD    -(R4)           ;VIRT+(KSP)+
001666  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
001672  022704  140000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
001676  001401                          BEQ     .+4
001700  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
001702  005737  016700                  TST     @#PHYS          ;CHECK RESULT
001706  001401                          BEQ     .+4
001710  000000                          HLT                     ;ERROR! INCORRECT RESULT
001712  104000                          SCOPE
                        ;DM=5
001714  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
001722  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
001726  012702  140004                  MOV     #VIRT+4,R12     ;LOAD INDIRECT ADDRESS
001732  012767  140000  014742          MOV     #VIRT,PHYS+2    ;LOAD ADDRESS
001740  005037  016700                  CLR     @#PHYS          ;PRESET DATA
001744  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
001750  106652              KK5:        MTPD    @-(R12)         ;VIRT+(KSP)+
001752  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
001756  005237  016700                  INC     @#PHYS          ;CHECK RESULT
001762  001401                          BEQ     .+4
001764  000000                          HLT                     ;ERROR! INCORRECT RESULT
001766  005037  177776                  CLR     @#PSW
001772  104000                          SCOPE

                        ;DM=6
001774  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
002002  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
002004  012702  000002                  MOV     #2,R12          ;LOAD INDEX REGISTER
```

```
002010  012767  177777  014664          MOV     #-1,PHYS+2      ;PRESET DATA
002016  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
002022  106662  140000          KK6:    MTPD    VIRT(R12)       ;VIRT+2+(KSP)+
002026  013700  177776                  MOV     @#PSW,R10       ;SAVE STATUS RESULT
002032  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
002036  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
002042  001401                          BEQ     .+4
002044  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
002046  122700  004004                  CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
002052  001401                          BEQ     .+4
002054  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
002056  005737  016702                  TST     @#PHYS+2                ;CHECK RESULT
002062  001401                          BEQ     .+4
002064  000000                          HLT                     ;ERROR! INCORRECT RESULT
002066  104000                          SCOPE

                        ;DM=7
002070  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002074  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
002100  012737  140000  016704          MOV     #VIRT,@#PHYS+4  ;LOAD ADDRESS
002106  005037  016700                  CLR     @#PHYS          ;PRESET DATA
002112  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
002116  106672  140002          KK7:    MTPD    @VIRT+2(R2)     ;VIRT+(KSP)+
002122  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
002126  005237  016700                  INC     @#PHYS          ;CHECK RESULT
002132  001401                          BEQ     .+4
002134  000000                          HLT                     ;ERROR! INCORRECT RESULT
002136  104000                          SCOPE

                        ;TEST THAT MTPD CAN LOAD KERNEL 'D' SPACE
                        ;DM=1,PC
002140  012737  002156  000250                  MOV     #KK10B,@#MMVEC  ;LOAD MEM MGMT ABORT TRAP VECTOR
002146  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
002152  106617                  KK10:   MTPD    (PC)            ;T11A+(KSP)+ SHOULD ABORT
002154  000000                  KK10A:  HALT                    ;ERROR!  MTPD DID NOT ABORT
002156                          KK10B:
002156  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
002162  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
002166  001401                          BEQ     .+4
002170  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
002172  104000                          SCOPE

                        ;DM=2,PC
002174  012737  002214  000250                  MOV     #KK11B,@#MMVEC  ;LOAD MEM MGMT ABORT TRAP VECTOR
002202  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
002206  106627  000000          KK11:   MTPD    #0              ;(PC)++(KSP)+ SHOULD ABORT
002212  000000                  KK11A:  HLT                     ;ERROR! FAILED TO ABORT
002214                          KK11B:
002214  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
002220  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
002224  001401                          BEQ     .+4
002226  000000                          HLT                     ;ERROR! INCORRECT STACK PTR AFTER ABORT
002230  104000                          SCOPE

                        ;DM=3,PC
002232  012737  004000  177776                  MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
```

```
002240  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002244  005037  016700                CLR     @#PHYS
002250  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002254  106637  140000        KK12:   MTPD    @#VIRT          ;VIRT+(KSP)+
002260  013700  177776                MOV     @#PSW,R10       ;SAVE STATUS RESULT
002264  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002270  122700  004010                CMPB    #REG+N,R10      ;CHECK STATUS RESULT
002274  001401                        BEQ     .+4
002276  000000                        HLT                     ;ERROR!  INCORRECT STATUS RESULT
002300  005267  014374                INC     PHYS            ;CHECK RESULT
002304  001401                        BEQ     .+4
002306  000000                        HLT                     ;ERROR!  INCORRECT RESULT
002310  005037  177776                CLR     @#PSW
002314  104000                        SCOPE

                        ;DM=6,PC
002316  012737  000340  177776        MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
002324  005016                        CLR     (KSP)           ;PUT #0 ON KERNEL STACK
002326  012767  177777  014350        MOV     #-1,PHYS+4
002334  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002340  000277                        SCC
002342  106667  135436        KK13:   MTPD    VIRT+4          ;VIRT+4+(KSP)+
002346  013703  177776                MOV     @#PSW,R3        ;SAVE STATUS RESULT
002352  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002356  022706  001062                CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
002362  001401                        BEQ     .+4
002364  000000                        HLT                     ;ERROR!  INCORRECT STACK PTR
002366  122703  000345                CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
002372  001401                        BEQ     .+4
002374  000000                        HLT                     ;ERROR!  INCORRECT STATUS RESULT
002376  005737  016704                TST     @#PHYS+4                ;CHECK RESULT
002402  001401                        BEQ     .+4
002404  000000                        HLT                     ;ERROR!  INCORRECT RESULT
002406  104000                        SCOPE

                        ;DM=7,PC
002410  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002414  012737  140004  016700        MOV     #VIRT+4,@#PHYS  ;LOAD ADDRESS
002422  005037  016704                CLR     @#PHYS+4                ;PRESET DATA
002426  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT

002432  106677  135342        KK14:   MTPD    @VIRT           ;VIRT+4+(KSP)+
002436  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002442  005237  016704                INC     @#PHYS+4                ;CHECK RESULT
002446  001401                        BEQ     .+4
002450  000000                        HLT                     ;ERROR INCORRECT RESULT
002452  104000                        SCOPE


                        ;CHECK THAT MTPD CAN SET STACK PTR
002454  012737  004000  177776        MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
002462  005016                        CLR     (KSP)           ;PUT #0 ON KERNEL STACK
002464  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002470  106606        KK15:   MTPD    KSP             ;KSP+(KSP)+
002472  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
```

```
002476  005706                          TST     KSP             ;CHECK STACK PTR
002500  001401                          BEQ     .+4
002502  000000                          HLT                     ;ERROR!
002504  012706  001060                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
002510  104000                          SCOPE
```

```
                                ;TESTS KS0-KS16 TEST THE MTPD INSTRUCTION IN KERNEL MODE, PREV SUPER MODE.
                                ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)

                                ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER
002512  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
002520  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002524  005002                        CLR     R12             ;PRESET REGISTER
002526  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002532  000277                        SCC
002534  106602                KS0:    MTPD    R12             ;R12←(KSP)+
002536  013703  177776                MOV     @#PSW,R13       ;SAVE STATUS RESULT
002542  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002546  122703  004011                CMPB    #REG+N+C,R13    ;CHECK STATUS RESULT
002552  001401                        BEQ     .+4
002554  000000                        HLT                     ;ERROR INCORRECT STATUS RESULT
002556  005202                        INC     R12             ;CHECK RESULT
002560  001401                        BEQ     .+4
002562  000000                        HLT                     ;ERROR! INCORRECT RESULT
002564  104000                        SCOPE

                                ;TEST THAT KERNEL CAN LOAD SUPER 'D' ADDRESS (VIRT)
                                ;DM=1

                020000                  VIRT=20000      ;SUPER VIRTUAL 'D' ADDRESS FOR THESE TESTS
                017100                  PHYS=17100      ;CORRESPONDING PHYSICAL 'D' ADDRESS

002566  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
002574  005016                        CLR     (KSP)           ;PUT #0 ON KERNEL STACK
002576  012702  020000                MOV     #VIRT,R2                ;R2=VIRT ADDRESS
002602  012737  177777  017100        MOV     #-1,@#PHYS      ;PRESET DATA
002610  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002614  000277                        SCC
002616  106612                KS1:    MTPD    (R2)            ;VIRT←(KSP)+
002620  016703  175152                MOV     PSW,R3          ;SAVE STATUS RESULT
002624  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002630  022706  001062                CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
002634  001401                        BEQ     .+4
002636  000000                        HLT                     ;ERROR! INCORRECT STACK PTR
002640  122703  000005                CMPB    #Z+C,R3         ;CHECK STATUS RESULT
002644  001401                        BEQ     .+4
002646  000000                        HLT                     ;ERROR! INCORRECT STATUS RESULT
002650  005737  017100                TST     @#PHYS          ;CHECK RESULT
002654  001401                        BEQ     .+4
002656  000000                        HLT                     ;ERROR! INCORRECT RESULT
002660  104000                        SCOPE

                                ;DM=2
002662  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
002670  012716  177777                MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002674  012702  020000                MOV     #VIRT,R12       ;R12=VIRT ADDRESS
002700  005037  017100                CLR     @#PHYS          ;PRESET DATA
002704  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
002710  106622                KS2:    MTPD    (R12)+          ;VIRT←(KSP)+
002712  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
002716  005237  017100                INC     @#PHYS          ;CHECK RESULT
002722  001401                        BEQ     .+4
```

```
002724  000000                          HLT             ;ERROR! INCORRECT RESULT
002726  022702  020002                  CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
002732  001401                          BEQ     .+4
002734  000000                          HLT             ;ERROR! AUTO-INCREMENT FAILED
002736  005067  175034                  CLR     PSW
002742  104000                          SCOPE
                                ;DM=3
002744  012737  010340  177776          MOV     #PSM+PRTY7,@#PSW        ;KERNEL MODE!!!, PREV SUPER MODE!!
002752  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
002756  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
002762  012712  020004                  MOV     #VIRT+4,(R2)    ;LOAD ADDRESS
002766  005037  017104                  CLR     @#PHYS+4        ;PRESET DATA
002772  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
002776  106632                  KS3:    MTPD    @(R2)+          ;VIRT+4+(KSP)+
003000  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003004  005237  017104                  INC     @#PHYS+4                ;CHECK RESULT
003010  001401                          BEQ     .+4
003012  000000                          HLT             ;ERROR! INCORRECT RESULT
003014  104000                          SCOPE
                                ;DM=4
003016  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003024  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
003026  012704  020002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
003032  012737  177777  017100          MOV     #-1,@#PHYS      ;PRESET DATA
003040  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003044  106644                  KS4:    MTPD    -(R4)           ;VIRT+(KSP)+
003046  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003052  022704  020000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
003056  001401                          BEQ     .+4
003060  000000                          HLT             ;ERROR! AUTO-DECREMENT FAILED
003062  005737  017100                  TST     @#PHYS          ;CHECK RESULT
003066  001401                          BEQ     .+4
003070  000000                          HLT             ;ERROR! INCORRECT RESULT
003072  104000                          SCOPE
                                ;DM=5
003074  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
003102  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
003106  012702  001010                  MOV     #TEMP+4,R12     ;LOAD INDIRECT ADDRESS
003112  012767  020000  175666          MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
003120  005037  017100                  CLR     @#PHYS          ;PRESET DATA
003124  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003130  106652                  KS5:    MTPD    @-(R12)         ;VIRT+(KSP)+
003132  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003136  005237  017100                  INC     @#PHYS          ;CHECK RESULT
003142  001401                          BEQ     .+4
003144  000000                          HLT             ;ERROR! INCORRECT RESULT
003146  005067  174624                  CLR     PSW
003152  104000                          SCOPE
                                ;DM=6
003154  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
003162  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
003164  012702  000002                  MOV     #2,R12          ;LOAD INDEX REGISTER
003170  012767  177777  013704          MOV     #-1,PHYS+2      ;PRESET DATA
```

```
003176  005237  177572          KS6:    INC     @#SR0           ;ENABLE MEM MGMT
003202  106662  020000                  MTPD    VIRT(R12)       ;VIRT+2←(KSP)+
003206  016700  174564                  MOV     PSW,R10         ;SAVE STATUS RESULT
003212  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003216  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
003222  001401                          BEQ     .+4
003224  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
003226  122700  004004                  CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
003232  001401                          BEQ     .+4
003234  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
003236  005737  017102                  TST     @#PHYS+2                ;CHECK RESULT
003242  001401                          BEQ     .+4
003244  000000                          HLT                     ;ERROR! INCORRECT RESULT
003246  104000                          SCOPE

                        ;DM=7
003250  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003256  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
003262  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
003266  012737  020000  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
003274  005037  017100                  CLR     @#PHYS          ;PRESET DATA
003300  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003304  106672  001006          KS7:    MTPD    @TEMP+2(R2)     ;VIRT←(KSP)+
003310  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003314  005237  017100                  INC     @#PHYS          ;CHECK RESULT
003320  001401                          BEQ     .+4
003322  000000                          HLT                     ;ERROR! INCORRECT RESULT
003324  104000                          SCOPE

                        ;TEST THAT MTPD CAN LOAD PC
                        ;DM=0,PC
003326  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003334  012716  003350                  MOV     #KS10A,(KSP)    ;PUT NEW PC ON STACK AS DATA
003340  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003344  106607          KS10:   MTPD    PC                      ;PC←(KSP)+
003346  000000                  HLT                             ;ERROR! MTPD DID NOT LOAD PC
003350          KS10A:
003350  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003354  104000                          SCOPE

                        ;DM=2,PC
003356  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003364  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
003370  005037  003414                  CLR     @#KS11+2        ;CLEAR ADRS FOLLOWING MTPD
003374  012767  003420  174646          MOV     #KS11A,MMVEC    ;SET MEM MGMT ERROR VECTOR
003402  005067  174644                  CLR     MMVEC+2
003406  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003412  106627          KS11:   MTPD    (PC)+                   ;(PC)+←(KSP)+, SHOULD ABORT
003414  000000                  HLT                             ;ERROR! DID NOT ABORT AND PC DID NOT
                                                                ;AUTO-INCREMENT
003416  000000                  HLT                             ;ERROR! DID NOT ABORT
003420          KS11A:
003420  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003424  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
003430  001401                          BEQ     .+4
003432  000000                          HLT                     ;ERROR! STACK PTR NOT PUSHED TWICE ON ERROR
```

```
003434  012737  000512  000250          MOV     #MMERR,@#MMVEC
003442  104000                          SCOPE


                                ;DM=3,PC
003444  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
003452  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
003456  005037  017100                  CLR     @#PHYS
003462  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003466  106637  020000          KS12:   MTPD    @#VIRT          ;VIRT+(KSP)+
003472  016700  174300                  MOV     PSW,R10         ;SAVE STATUS RESULT
003476  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003502  122700  004010                  CMPB    #REG+N,R10      ;CHECK STATUS RESULT
003506  001401                          BEQ     .+4
003510  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
003512  005267  013362                  INC     PHYS            ;CHECK RESULT
003516  001401                          BEQ     .+4
003520  000000                          HLT                     ;ERROR!  INCORRECT RESULT
003522  005067  174250                  CLR     PSW
003526  104000                          SCOPE

                                ;DM=4,PC
003530  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003536  016702  000012                  MOV     KS13,R2         ;SAVE MTPD INSTRUCTION
003542  012737  003560  000250          MOV     #KS13A,@#MMVEC  ;LOAD MEM MGMT ERR VECTOR
003550  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003554  106647          KS13:   MTPD    -(PC)                   ;-(PC)+(KSP)+ SHOULD ABORT
003556  000000                          HLT                     ;ERROR! FAILED TO ABORT
003560  022706  001056          KS13A:  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
003564  001401                          BEQ     .+4
003566  000000                          HLT                     ;ERROR! INCORRECT STACK PTR AFTER ERROR
003570  022737  140061  177572          CMP     #NRA+PLA+SPG+DS+VPD+1,@#SR0     ;CHECK ABORT CONDITIONS
003576  001401                          BEQ     .+4
003600  000000                          HLT                     ;ERROR! ABORT CONDTIONS ARE INCORRECT
003602  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003606  010267  177742                  MOV     R2,KS13         ;RESTORE INSTRUCTION
003612  012737  000512  000250          MOV     #MMERR,@#MMVEC
003620  104000                          SCOPE

                                ;DM=6,PC
003622  012737  010340  177776          MOV     #PSM+PRTY7,@#PSW        ;KERNEL MODE!!!, PREV SUPER MODE!!
003630  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
003632  012767  177777  013244          MOV     #-1,PHYS+4
003640  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003644  000277                          SCC
003646  106667  014132          KS14:   MTPD    VIRT+4          ;VIRT+4+(KSP)+
003652  016703  174120                  MOV     PSW,R3          ;SAVE STATUS RESULT
003656  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003662  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
003666  001401                          BEQ     .+4
003670  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
003672  122703  000345                  CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
003676  001401                          BEQ     .+4
003700  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
003702  005737  017104                  TST     @#PHYS+4                ;CHECK RESULT
003706  001401                          BEQ     .+4
```

```
003710  000000                          HLT                     ;ERROR!  INCORRECT RESULT
003712  104000                          SCOPE

                                ;DM=7,PC
003714  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
003722  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
003726  012737  020004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
003734  005037  017104                  CLR     @#PHYS+4                ;PRESET DATA
003740  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
003744  106677  175034          KS15:   MTPD    @TEMP           ;VIRT+4←(KSP)+
003750  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
003754  005237  017104                  INC     @#PHYS+4        ;CHECK RESULT
003760  001401                          BEQ     .+4
003762  000000                          HLT                     ;ERROR INCORRECT RESULT
003764  104000                          SCOPE

                                ;CHECK THAT MTPD CAN SET SUPER STACK PTR & PUT DATA ON THE SUPER STACK
003766  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
003774  012746  020000                  MOV     #VIRT,-(KSP)    ;PUT SUPER STACK PTR VALUE ON STACK
004000  005046                          CLR     -(KSP)          ;PUT DATA ON THE STACK
004002  012746  020000                  MOV     #VIRT,-(KSP)
004006  012737  177777  017100          MOV     #-1,@#PHYS      ;PRESET SUPER STACK DATA
004014  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004020  106606                  KS16:   MTPD    SSP             ;SSP←(KSP)+
004022  106636                          MTPD    @(KSP)+         ;VIRT←(KSP)+
004024  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004030  106506                          MFPD    SSP             ;SET SUPER STACK PTR
004032  022716  020000                  CMP     #VIRT,(KSP)     ;CHECK THAT MTPD  SSP SET SUPER STACK
004036  001401                          BEQ     .+4             ;PTR
004040  000000                          HLT                     ;ERROR! MTPD  SSP FAILED
004042  005737  017100                  TST     @#PHYS          ;CHECK THAT MTPD  @(KSP)+ PUT THE COR-
004046  001401                          BEQ     .+4             ;RECT DATA ONTO THE SUPER STACK
004050  000000                          HLT                     ;ERROR! INCORRECT DATA AT PHYS
004052  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK KERNEL STACK PTR
004056  001401                          BEQ     .+4             ;4 PUSHES & 3 POPS
004060  000000                          HLT                     ;ERROR! INCORRECT STACK PTR AFTER TEST
004062  104000                          SCOPE
```

```
                                ;TESTS KUU-KU15 TEST THE MTPD INSTRUCTION KERNEL MODE, PREV USER MODE.
                                ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)

                                ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER
004064  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
004072  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004076  005002                          CLR     R12             ;PRESET REGISTER
004100  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004104  000277                          SCC
004106  106602                  KU0:    MTPD    R12             ;R12←(KSP)+
004110  016703  173662                  MOV     PSW,R13         ;SAVE STATUS RESULT
004114  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004120  122703  004011                  CMPB    #REG+N+C,R13    ;CHECK STATUS RESULT
004124  001401                          BEQ     .+4
004126  000000                          HLT                     ;ERROR INCORRECT STATUS RESULT
004130  005202                          INC     R12             ;CHECK RESULT
004132  001401                          BEQ     .+4
004134  000000                          HLT                     ;ERROR! INCORRECT RESULT
004136  104000                          SCOPE

                                ;TEST THAT KERNEL CAN LOAD USER 'D' ADDRESS (VIRT)
                                ;DM=1

100000                                  VIRT=100000     ;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
017300                                  PHYS=17300      ;CORRESPONDIG PHYSICAL 'D' ADDRESS

004140  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
004146  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
004150  012702  100000                  MOV     #VIRT,R2                ;R2=VIRT ADDRESS
004154  012737  177777  017300          MOV     #-1,@#PHYS      ;PRESET DATA
004162  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004166  000277                          SCC
004170  106612                  KU1:    MTPD    (R2)            ;VIRT←(KSP)+
004172  016703  173600                  MOV     PSW,R3          ;SAVE STATUS RESULT
004176  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004202  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
004206  001401                          BEQ     .+4
004210  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
004212  122703  000005                  CMPB    #Z+C,R3         ;CHECK STATUS RESULT
004216  001401                          BEQ     .+4
004220  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
004222  005737  017300                  TST     @#PHYS          ;CHECK RESULT
004226  001401                          BEQ     .+4
004230  000000                          HLT                     ;ERROR! INCORRECT RESULT
004232  104000                          SCOPE

                                ;DM=2
004234  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
004242  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004246  012702  100000                  MOV     #VIRT,R12       ;R12=VIRT ADDRESS
004252  005037  017300                  CLR     @#PHYS          ;PRESET DATA
004256  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004262  106622                  KU2:    MTPD    (R12)+          ;VIRT←(KSP)+
004264  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004270  005237  017300                  INC     @#PHYS          ;CHECK RESULT
004274  001401                          BEQ     .+4
```

```
004276  000000                          HLT             ;ERROR! INCORRECT RESULT
004300  022702  100002                  CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
004304  001401                          BEQ     .+4
004306  000000                          HLT             ;ERROR! AUTO-INCREMENT FAILED
004310  005067  173462                  CLR     PSW
004314  104000                          SCOPE
                        ;DM=3
004316  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
004324  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004330  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
004334  012712  100004                  MOV     #VIRT+4,(R2)    ;LOAD ADDRESS
004340  005037  017304                  CLR     @#PHYS+4                ;PRESET DATA
004344  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004350  106632                  KU3:    MTPD    @(R2)+          ;VIRT+4-(KSP)+
004352  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004356  005237  017304                  INC     @#PHYS+4                ;CHECK RESULT
004362  001401                          BEQ     .+4
004364  000000                          HLT             ;ERROR! INCORRECT RESULT
004366  104000                          SCOPE

                        ;DM=4
004370  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
004376  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
004400  012704  100002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
004404  012737  177777  017300          MOV     #-1,@#PHYS      ;PRESET DATA
004412  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004416  106644                  KU4:    MTPD    -(R4)           ;VIRT-(KSP)+
004420  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004424  022704  100000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
004430  001401                          BEQ     .+4
004432  000000                          HLT             ;ERROR! AUTO-DECREMENT FAILED
004434  005737  017300                  TST     @#PHYS          ;CHECK RESULT
004440  001401                          BEQ     .+4
004442  000000                          HLT             ;ERROR! INCORRECT RESULT
004444  104000                          SCOPE

                        ;DM=5
004446  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
004454  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004460  012702  001010                  MOV     #TEMP+4,R12     ;LOAD INDIRECT ADDRESS
004464  012767  100000  174314          MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
004472  005037  017300                  CLR     @#PHYS          ;PRESET DATA
004476  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004502  106652                  KU5:    MTPD    @-(R12)         ;VIRT-(KSP)+
004504  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004510  005237  017300                  INC     @#PHYS          ;CHECK RESULT
004514  001401                          BEQ     .+4
004516  000000                          HLT             ;ERROR! INCORRECT RESULT
004520  005067  173252                  CLR     PSW
004524  104000                          SCOPE

                        ;DM=6
004526  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
004534  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
004536  012702  000002                  MOV     #2,R12          ;LOAD INDEX REGISTER
004542  012767  177777  012532          MOV     #-1,PHYS+2      ;PRESET DATA
```

```
004550  005237  177572          INC     @#SR0           ;ENABLE MEM MGMT
004554  106662  100000  KU6:    MTPD    VIRT(R12)       ;VIRT+2←(KSP)+
004560  016700  173212          MOV     PSW,R10         ;SAVE STATUS RESULT
004564  005037  177572          CLR     @#SR0           ;DISABLE MEM MGMT
004570  022706  001062          CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
004574  001401                  BEQ     .+4
004576  000000                  HLT                     ;ERROR! INCORRECT STACK PTR
004600  122700  004004          CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
004604  001401                  BEQ     .+4
004606  000000                  HLT                     ;ERROR! INCORRECT STATUS RESULT
004610  005737  017302          TST     @#PHYS+2                ;CHECK RESULT
004614  001401                  BEQ     .+4
004616  000000                  HLT                     ;ERROR! INCORRECT RESULT
004620  104000                  SCOPE

                        ;DM=7
004622  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
004630  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004634  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
004640  012737  100000  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
004646  005037  017300                  CLR     @#PHYS          ;PRESET DATA
004652  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004656  106672  001006          KU7:    MTPD    @TEMP+2(R2)     ;VIRT←(KSP)+
004662  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004666  005237  017300                  INC     @#PHYS          ;CHECK RESULT
004672  001401                          BEQ     .+4
004674  000000                          HLT                     ;ERROR! INCORRECT RESULT
004676  104000                          SCOPE

                        ;TEST THAT MTPD CAN LOAD USER 'D' SPACE
                        ;DM=0,PC
004700  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
004706  012716  004722                  MOV     #KU10A,(KSP)    ;PUT NEW PC ON STACK AS DATA
004712  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004716  106607          KU10:   MTPD    PC                      ;PC←(KSP)+
004720  000000                  HLT                             ;ERROR! MTPD DID NOT LOAD PC
004722          KU10A:
004722  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004726  104000                          SCOPE

                        ;DM=2,PC
004730  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
004736  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
004742  005037  004720                  CLR     @#KU10+2        ;CLEAR ADRS FOLLOWING MTPD
004746  012737  004766  000250          MOV     #KU11A,@#MMVEC  ;SET MEM MGMT ERROR VECTOR
004754  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
004760  106627          KU11:   MTPD    (PC)+                   ;(PC)+←(KSP)+, SHOULD ABORT
004762  000000                  HLT                             ;ERROR! DID NOT ABORT AND PC DID NOT
                                                                ;AUTO-INCREMENT
004764  000000                  HLT                             ;ERROR! DID NOT ABORT
004766          KU11A:
004766  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
004772  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK STACK PTR
004776  001401                          BEQ     .+4
005000  000000                          HLT                     ;ERROR! STACK PTR NOT PUSHED TWICE ON ERROR
005002  012737  000512  000250          MOV     #MMERR,@#MMVEC
```

```
005010  104000                          SCOPE

                                ;DM=3,PC
005012  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
005020  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
005024  005037  017300                  CLR     @#PHYS
005030  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
005034  106637  100000          KU12:   MTPD    @#VIRT          ;VIRT+-(KSP)+
005040  016700  172732                  MOV     PSW,R10         ;SAVE STATUS RESULT
005044  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
005050  122700  004010                  CMPB    #REG+N,R10      ;CHECK STATUS RESULT
005054  001401                          BEQ     .+4
005056  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
005060  005267  012214                  INC     PHYS            ;CHECK RESULT
005064  001401                          BEQ     .+4
005066  000000                          HLT                     ;ERROR!  INCORRECT RESULT
005070  005067  172702                  CLR     PSW
005074  104000                          SCOPE

                                ;DM=4,PC
005076  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
005104  012716                          MOV     (PC)+,(KSP)     ;MOV A BR  .+4 ONTO THE STACK
005106  000401                          BR      .+4             ;THIS INST IS NOT EXECUTED
005110  016702  000012                  MOV     KU13,R2         ;SAVE MTPD INSTRUCTION
005114  012737  025006  177620          MOV     #53*400-400+UP+RW,@#UDPDR0      ;LOAD UDPDR0 RW,UP 53 BLOCKS
005122  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
005126  106647                  KU13:   MTPD    -(PC)           ;-(PC)+(KSP)+
005130  000000                          HLT                     ;ERROR! MTPD FAILED
005132                          KU13A:
005132  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
005136  010267  177764                  MOV     R2,KU13         ;RESTORE MTPD INSTRUCTION
005142  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK STACK PTR
005146  001401                          BEQ     .+4
005150  000000                          HLT                     ;ERROR! INCORRECT STACK PTR AFTER ERROR
005152  005037  177620                  CLR     @#UDPDR0
005156  104000                          SCOPE

                                ;DM=6,PC
005160  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
005166  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
005170  012767  177777  012106          MOV     #-1,PHYS+4
005176  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
005202  000277                          SCC
005204  106667  072574          KU14:   MTPD    VIRT+4          ;VIRT+4+-(KSP)+
005210  016703  172562                  MOV     PSW,R3          ;SAVE STATUS RESULT
005214  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
005220  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
005224  001401                          BEQ     .+4
005226  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
005230  122703  000345                  CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
005234  001401                          BEQ     .+4
005236  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
005240  005737  017304                  TST     @#PHYS+4                ;CHECK RESULT
005244  001401                          BEQ     .+4
005246  000000                          HLT                     ;ERROR!  INCORRECT RESULT
005250  104000                          SCOPE
```

```
                                        ;DM=7,PC
005252  012737  030000  177776            MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
005260  012716  177777                    MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
005264  012737  100004  001004            MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
005272  005037  017304                    CLR     @#PHYS+4        ;PRESET DATA
005276  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
005302  106677  173476            KU15:   MTPD    @TEMP           ;VIRT+4+(KSP)+
005306  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
005312  005237  017304                    INC     @#PHYS+4        ;CHECK RESULT
005316  001401                            BEQ     .+4
005320  000000                            HLT                     ;ERROR INCORRECT RESULT
005322  104000                            SCOPE

                                        ;CHECK THAT MTPD CAN SET USER STACK PTR & PUSH DATA ONTO THE USER STACK.
005324  012737  030000  177776            MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
005332  012746  100000                    MOV     #VIRT,-(KSP)    ;PUSH NEW USER STACK PTR ONTO STACK
005336  005046                            CLR     -(KSP)          ;PUT DATA ONTO STACK
005340  012746  100000                    MOV     #VIRT,-(KSP)
005344  012737  177777  017300            MOV     #-1,@#PHYS      ;PRESET DATA ON USER STACK
005352  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
005356  106606            KU16:   MTPD    USP                     ;USP+(KSP)+
005360  106676  000000                    MTPD    @(KSP)          ;VIRT+(KSP)+
005364  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
005370  106506                            MFPD    USP             ;GET USER STACK PTR
005372  022716  100000                    CMP     #VIRT,(KSP)     ;CHECK THAT MTPD  USP SET USER STACK PTR
005376  001401                            BEQ     .+4
005400  000000                            HLT                     ;ERROR! MTPD  USP FAILED TO SET STACK PTR
005402  005737  017300                    TST     @#PHYS          ;CHECK THAT MTPD  @(KSP)+ PUT THE COR-
005406  001401                            BEQ     .+4             ;RECT DATA ONTO THE USER STACK
005410  000000                            HLT                     ;ERROR! MTPD  @(KSP)+ FAILED
005412  022706  001054                    CMP     #KPTR-4,KSP     ;CHECK KERNEL STACK PTR
005416  001401                            BEQ     .+4             ;4 PUSHES & 3 POPS
005420  000000                            HLT                     ;ERROR!INCORRECT KERENL STACK PTR AFTER TEST
005422  104000                            SCOPE
```

```
                                        ;TESTS KKI0-KK16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV KERNEL MODE.
            016600                              VIRT=16600              ;KERNEL VIRTUAL 'I' ADDRESS FOR THESE TESTS
            016600                              PHYS=16600              ;CORRESPONDING KERNEL PHYSICAL 'I' ADDRESS

                                        ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
005424  012737  000340  177776          KKI0:   MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
005432  005016                                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
005434  012702  177777                          MOV     #-1,R2          ;PRESET REGISTER
005440  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
005444  006602                                  MTPI    R2              ;R2←(KSP)+
005446  016703  172324                          MOV     PSW,R3          ;SAVE STATUS RESULT
005452  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
005456  022706  001062                          CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
005462  001401                                  BEQ     .+4
005464  000000                                  HLT                     ;ERROR!  INCORRECT STACK PTR
005466  122703  000344                          CMPB    #PRTY7+Z,R3     ;CHECK STATUS RESULT
005472  001401                                  BEQ     .+4
005474  000000                                  HLT                     ;ERROR! INCORRECT STATUS RESULT
005476  005702                                  TST     R2              ;CHECK RESULT
005500  001401                                  BEQ     .+4
005502  000000                                  HLT                     ;ERROR!  INCORRECT RESULT
005504  104000                                  SCOPE

                                        ;TEST THAT MTPI CAN LOAD KERNEL 'I' ADDRESS (VIRT)
                                        ;DM=1
005506  005016                                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
005510  012702  016600                          MOV     #VIRT,R2                ;R2=VIRT ADDRESS
005514  012737  177777  016600                  MOV     #-1,@#PHYS      ;PRESET DATA
005522  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
005526  000277                                  SCC
005530  006612                          KKI1:   MTPI    (R2)            ;VIRT←(KSP)+
005532  016703  172240                          MOV     PSW,R3          ;SAVE STATUS RESULT
005536  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
005542  022706  001062                          CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
005546  001401                                  BEQ     .+4
005550  000000                                  HLT                     ;ERROR! INCORRECT STACK PTR
005552  122703  000005                          CMPB    #Z+C,R3         ;CHECK STATUS RESULT
005556  001401                                  BEQ     .+4
005560  000000                                  HLT                     ;ERROR! INCORRECT STATUS RESULT
005562  005737  016600                          TST     @#PHYS          ;CHECK RESULT
005566  001401                                  BEQ     .+4
005570  000000                                  HLT                     ;ERROR! INCORRECT RESULT
005572  104000                                  SCOPE

                                        ;DM=2
005574  012737  004000  177776          KKI2:   MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
005602  012716  177777                          MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
005606  012702  016600                          MOV     #VIRT,R12       ;R12=VIRT ADDRESS
005612  005037  016600                          CLR     @#PHYS          ;PRESET DATA
005616  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
005622  006622                                  MTPI    (R12)+          ;VIRT←(KSP)+
005624  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
005630  005237  016600                          INC     @#PHYS          ;CHECK RESULT
```

```
005634  001401                          BEQ     .+4
005636  000000                          HLT
005640  022702  016602                  CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
005644  001401                          BEQ     .+4
005646  000000                          HLT                     ;ERROR! AUTO-INCREMENT FAILED
005650  005067  172122                  CLR     PSW
005654  104000                          SCOPE
                                ;DM=3
005656  012737  000340  177776          MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
005664  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
005670  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
005674  012737  016604  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
005702  005037  016604                  CLR     @#PHYS+4        ;PRESET DATA
005706  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
005712  006632                  KKI3:   MTPI    @(R2)+          ;VIRT+4->(KSP)+
005714  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
005720  005237  016604                  INC     @#PHYS+4                ;CHECK RESULT
005724  001401                          BEQ     .+4
005726  000000                          HLT                     ;ERROR! INCORRECT RESULT
005730  104000                          SCOPE

                                ;DM=4
005732  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
005734  012704  016602                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
005740  012737  177777  016600          MOV     #-1,@#PHYS      ;PRESET DATA
005746  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
005752  006644                  KKI4:   MTPI    -(R4)           ;VIRT->(KSP)+
005754  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
005760  022704  016600                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
005764  001401                          BEQ     .+4
005766  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
005770  005737  016600                  TST     @#PHYS          ;CHECK RESULT
005774  001401                          BEQ     .+4
005776  000000                          HLT                     ;ERROR! INCORRECT RESULT
006000  104000                          SCOPE

                                ;DM=5
006002  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006010  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
006014  012702  001010                  MOV     #TEMP+4,R12     ;LOAD INDIRECT ADDRESS
006020  012767  016600  172760          MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
006026  005037  016600                  CLR     @#PHYS          ;PRESET DATA
006032  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
006036  006652                  KKI5:   MTPI    @-(R12)         ;VIRT->(KSP)+
006040  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006044  005237  016600                  INC     @#PHYS          ;CHECK RESULT
006050  001401                          BEQ     .+4
006052  000000                          HLT                     ;ERROR! INCORRECT RESULT
006054  005067  171716                  CLR     PSW
006060  104000                          SCOPE

                                ;DM=6
006062  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006070  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
006072  012702  000002                  MOV     #2,R12          ;LOAD INDEX REGISTER
006076  012767  177777  010476          MOV     #-1,PHYS+2      ;PRESET DATA
```

```
006104  005237  177572          KKI6:   INC     @#SR0           ;ENABLE MEM MGMT
006110  006662  016600                  MTPI    VIRT(R12)       ;VIRT+2+(KSP)+
006114  016700  171656                  MOV     PSW,R10         ;SAVE STATUS RESULT
006120  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006124  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
006130  001401                          BEQ     .+4
006132  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
006134  122700  004004                  CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
006140  001401                          BEQ     .+4
006142  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
006144  005737  016602                  TST     @#PHYS+2                ;CHECK RESULT
006150  001401                          BEQ     .+4
006152  000000                          HLT                     ;ERROR! INCORRECT RESULT
006154  104000                          SCOPE

                        ;DM=7
006156  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
006162  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
006166  012737  016600  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
006174  005037  016600                  CLR     @#PHYS          ;PRESET DATA
006200  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
006204  006672  001006          KKI7:   MTPI    @TEMP+2(R2)     ;VIRT+(KSP)+
006210  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006214  005237  016600                  INC     @#PHYS          ;CHECK RESULT
006220  001401                          BEQ     .+4
006222  000000                          HLT                     ;ERROR! INCORRECT RESULT
006224  104000                          SCOPE

                        ;TEST THAT MTPI CAN LOAD KERNEL 'I' SPACE
                        ;DM=1,PC
006226  012716  000403          KKI10B: MOV     #403,(KSP)      ;PUT BR .+10 INST AS DATA ON STACK
006232  005037  006244                  CLR     @#KKI10A        ;PUT HALT FOLLOWING MTPI
006236  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
006242  006617                  KKI10:  MTPI    (PC)            ;KKI10A+(KSP)+
006244  000000                  KKI10A: HALT                    ;ERROR!  MTPI DID NOT POP BR .+10
                                                                ;INTO KKI10A
006246  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006252  000765                          BR      KKI10B          ;LOOP TEST IF ERROR
006254  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006260  104000                          SCOPE

                        ;DM=2,PC
006262  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
006266  005067  000006                  CLR     KKI11A
006272  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
006276  006627                  KKI11:  MTPI    (PC)+           ;(PC)++(KSP)+
006300  000000                  KKI11A: 0
006302  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006306  005267  177766                  INC     .-6             ;CHECK THAT DATA POPPED TO
006312  001401                          BEQ     .+4             ;CORRECT ADDRESS
006314  000000                          HLT                     ;ERROR!
006316  104000                          SCOPE

                        ;DM=3,PC
006320  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006326  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
```

```
006332  005037  016600                 CLR     @#PHYS
006336  005237  177572                 INC     @#SR0           ;ENABLE MEM MGMT
006342  006637  016600         KKI12:  MTPI    @#VIRT          ;VIRT+(KSP)+
006346  016700  171424                 MOV     PSW,R10         ;SAVE STATUS RESULT
006352  005037  177572                 CLR     @#SR0           ;DISABLE MEM MGMT
006356  122700  004010                 CMPB    #REG+N,R10      ;CHECK STATUS RESULT
006362  001401                         BEQ     .+4
006364  000000                         HLT                     ;ERROR!  INCORRECT STATUS RESULT
006366  005267  010206                 INC     PHYS            ;CHECK RESULT
006372  001401                         BEQ     .+4
006374  000000                         HLT                     ;ERROR!  INCORRECT RESULT
006376  005067  171374                 CLR     PSW
006402  104000                         SCOPE

                                ;DM=4,PC
006404  012737  004000  177776         MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006412  012716  000401                 MOV     #401,(KSP)      ;PUT BR .+4 ON STACK AS DATA
006416  016702  000004                 MOV     KKI13,R12       ;SAVE MTPI INSTRUCTION
006422  005237  177572                 INC     @#SR0           ;ENABLE MEM MGMT
006426  006647                 KKI13:  MTPI    -(PC)           ;-(PC)+(KSP)+
006430  000000                         HALT                    ;ERROR!  MTPI - (PC) FAILED
006432  005037  177572                 CLR     @#SR0           ;DISABLE MEM MGMT
006436  010267  177764                 MOV     R12,KKI13       ;RESTORE INSTRUCTION
006442  104000                         SCOPE

                                ;DM=6,PC
006444  012737  000340  177776         MOV     #PRTY7,@#PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
006452  005016                         CLR     (KSP)           ;PUT #0 ON KERNEL STACK
006454  012767  177777  010122         MOV     #-1,PHYS+4
006462  005237  177572                 INC     @#SR0           ;ENABLE MEM MGMT
006466  000277                         SCC
006470  006667  010110         KKI14:  MTPI    VIRT+4          ;VIRT+4+(KSP)+
006474  016703  171276                 MOV     PSW,R3          ;SAVE STATUS RESULT
006500  005037  177572                 CLR     @#SR0           ;DISABLE MEM MGMT
006504  022706  001062                 CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
006510  001401                         BEQ     .+4
006512  000000                         HLT                     ;ERROR!  INCORRECT STACK PTR
006514  122703  000345                 CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
006520  001401                         BEQ     .+4
006522  000000                         HLT                     ;ERROR!  INCORRECT STATUS RESULT
006524  005737  016604                 TST     @#PHYS+4                ;CHECK RESULT
006530  001401                         BEQ     .+4
006532  000000                         HLT                     ;ERROR!  INCORRECT RESULT

006534  104000                 SCOPE
                                ;DM=7,PC

006536  005037  177776                 CLR     @#PSW           ;KERNEL MODE!!!,PREV KERNEL MODE!!
006542  012716  177777                 MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
006546  012737  016604  001004         MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
006554  005037  016604                 CLR     @#PHYS+4                ;PRESET DATA
006560  005237  177572                 INC     @#SR0           ;ENABLE MEM MGMT

006564  006677  172214         KKI15:  MTPI    @TEMP           ;VIRT+4+(KSP)+
006570  005037  177572                 CLR     @#SR0           ;DISABLE MEM MGMT
006574  005237  016604                 INC     @#PHYS+4                ;CHECK RESULT
```

```
006600  001401                          BEQ     .+4
006602  000000                          HLT                     ;ERROR INCORRECT RESULT
006604  104000                          SCOPE


                                ;CHECK THAT MTPI CAN SET STACK PTR
006606  012737  004000  177776          MOV     #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006614  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
006616  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
006622  006606                  KKI16:  MTPI    KSP             ;KSP←(KSP)+
006624  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
006630  005706                          TST     KSP             ;CHECK STACK PTR
006632  001401                          BEQ     .+4
006634  000000                          HLT                     ;ERROR!
006636  012706  001060                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
006642  104000                          SCOPE
```

```
                                        ;TESTS KSI0-KSI16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV SUPER MODE.
                                        ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER
006644  012737  014000  177776            MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
006652  012716  177777                    MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
006656  005002                            CLR     R12             ;PRESET REGISTER
006660  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
006664  000277                            SCC
006666  006602                    KSI0:   MTPI    R12             ;R12<-(KSP)+
006670  016703  171102                    MOV     PSW,R13         ;SAVE STATUS RESULT
006674  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
006700  122703  004011                    CMPB    #REG+N+C,R13    ;CHECK STATUS RESULT
006704  001401                            BEQ     .+4
006706  000000                            HLT                     ;ERROR INCORRECT STATUS RESULT
006710  005202                            INC     R12             ;CHECK RESULT
006712  001401                            BEQ     .+4
006714  000000                            HLT                     ;ERROR! INCORRECT RESULT
006716  104000                            SCOPE

                                        ;TEST THAT KERNEL CAN LOAD SUPER 'I' ADDRESS (VIRT)
                                        ;DM=1

        040000                          VIRT=40000      ;SUPER VIRTUAL 'I' ADDRESS FOR THESE TESTS
        017000                          PHYS=17000      ;CORRESPONDING PHYSICAL 'I' ADDRESS

006720  012737  010000  177776            MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
006726  005016                            CLR     (KSP)           ;PUT #0 ON KERNEL STACK
006730  012702  040000                    MOV     #VIRT,R2        ;R2=VIRT ADDRESS
006734  012737  177777  017000            MOV     #-1,@#PHYS      ;PRESET DATA
006742  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
006746  000277                            SCC
006750  006612                    KSI1:   MTPI    (R2)            ;VIRT<-(KSP)+
006752  016703  171020                    MOV     PSW,R3          ;SAVE STATUS RESULT
006756  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
006762  022706  001062                    CMP     #KPTR+2,KSP     ;CHECK THAT STACK POPPED
006766  001401                            BEQ     .+4
006770  000000                            HLT                     ;ERROR! INCORRECT STACK PTR
006772  122703  000005                    CMPB    #Z+C,R3         ;CHECK STATUS RESULT
006776  001401                            BEQ     .+4
007000  000000                            HLT                     ;ERROR! INCORRECT STATUS RESULT
007002  005737  017000                    TST     @#PHYS          ;CHECK RESULT
007006  001401                            BEQ     .+4
007010  000000                            HLT                     ;ERROR! INCORRECT RESULT
007012  104000                            SCOPE

                                        ;DM=2
007014  012737  014000  177776            MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007022  012716  177777                    MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007026  012702  040000                    MOV     #VIRT,R12       ;R12=VIRT ADDRESS
007032  005037  017000                    CLR     @#PHYS          ;PRESET DATA
007036  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
007042  006622                    KSI2:   MTPI    (R12)+          ;VIRT<-(KSP)+
007044  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
007050  005237  017000                    INC     @#PHYS          ;CHECK RESULT
007054  001401                            BEQ     .+4
007056  000000                            HLT                     ;ERROR! INCORRECT RESULT
```

```
007060  022702  040002          CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
007064  001401                  BEQ     .+4
007066  000000                  HLT                     ;ERROR! AUTO-INCREMENT FAILED
007070  005067  170702          CLR     PSW
007074  104000                  SCOPE
                        ;DM=3
007076  012737  010340  177776  MOV     #PSM+PRTY7,@#PSW        ;KERNEL MODE!!!, PREV SUPER MODE!!
007104  012716  177777          MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007110  012702  001004          MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
007114  012712  040004          MOV     #VIRT+4,(R2)    ;LOAD ADDRESS
007120  005037  017004          CLR     @#PHYS+4        ;PRESET DATA
007124  005237  177572          INC     @#SR0           ;ENABLE MEM MGMT
007130  006632          KSI3:   MTPI    @(R2)+          ;VIRT+4←(KSP)+
007132  005037  177572          CLR     @#SR0           ;DISABLE MEM MGMT
007136  005237  017004          INC     @#PHYS+4                ;CHECK RESULT
007142  001401                  BEQ     .+4
007144  000000                  HLT                     ;ERROR! INCORRECT RESULT
007146  104000                  SCOPE

                        ;DM=4
007150  012737  010000  177776  MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
007156  005016                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
007160  012704  040002          MOV     #VIRT+2,R4      ;LOAD ADDRESS
007164  012737  177777  017000  MOV     #-1,@#PHYS      ;PRESET DATA
007172  005237  177572          INC     @#SR0           ;ENABLE MEM MGMT
007176  006644          KSI4:   MTPI    -(R4)           ;VIRT←(KSP)+
007200  005037  177572          CLR     @#SR0           ;DISABLE MEM MGMT
007204  022704  040000          CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
007210  001401                  BEQ     .+4
007212  000000                  HLT                     ;ERROR! AUTO-DECREMENT FAILED
007214  005737  017000          TST     @#PHYS          ;CHECK RESULT
007220  001401                  BEQ     .+4
007222  000000                  HLT                     ;ERROR! INCORRECT RESULT
007224  104000                  SCOPE

                        ;DM=5
007226  012737  014000  177776  MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007234  012716  177777          MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007240  012702  001010          MOV     #TEMP+4,R12     ;LOAD INDIRECT ADDRESS
007244  012767  040000  171534  MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
007252  005037  017000          CLR     @#PHYS          ;PRESET DATA
007256  005237  177572          INC     @#SR0           ;ENABLE MEM MGMT
007262  006652          KSI5:   MTPI    @-(R12)         ;VIRT←(KSP)+
007264  005037  177572          CLR     @#SR0           ;DISABLE MEM MGMT
007270  005237  017000          INC     @#PHYS          ;CHECK RESULT
007274  001401                  BEQ     .+4
007276  000000                  HLT                     ;ERROR! INCORRECT RESULT
007300  005067  170472          CLR     PSW
007304  104000                  SCOPE

                        ;DM=6
007306  012737  014000  177776  MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007314  005016                  CLR     (KSP)           ;PUT #0 ON KERNEL STACK
007316  012702  000002          MOV     #2,R12          ;LOAD INDEX REGISTER
007322  012767  177777  007452  MOV     #-1,PHYS+2      ;PRESET DATA
007330  005237  177572          INC     @#SR0           ;ENABLE MEM MGMT
```

```
007334  006662  040000          KSI6:   MTPI    VIRT(R12)       ;VIRT+2←(KSP)+
007340  016700  170432                  MOV     PSW,R10         ;SAVE STATUS RESULT
007344  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
007350  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
007354  001401                          BEQ     .+4
007356  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
007360  122700  004004                  CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
007364  001401                          BEQ     .+4
007366  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
007370  005737  017002                  TST     @#PHYS+2                ;CHECK RESULT
007374  001401                          BEQ     .+4
007376  000000                          HLT                     ;ERROR! INCORRECT RESULT
007400  104000                          SCOPE

                        ;DM=7
007402  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
007410  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007414  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
007420  012737  040000  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
007426  005037  017000                  CLR     @#PHYS          ;PRESET DATA
007432  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
007436  006672  001006          KSI7:   MTPI    @TEMP+2(R2)     ;VIRT←(KSP)+
007442  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
007446  005237  017000                  INC     @#PHYS          ;CHECK RESULT
007452  001401                          BEQ     .+4
007454  000000                          HLT                     ;ERROR! INCORRECT RESULT
007456  104000                          SCOPE

                        ;TEST THAT MTPI CAN LOAD SUPER 'I' SPACE
                        ;DM=0,PC
007460  012737  010000  177776                  MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
007466  012716  007502                          MOV     #KSI10A,(KSP)   ;PUT NEW PC ON STACK AS DATA
007472  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
007476  006607                  KSI10:  MTPI    PC              ;PC←(KSP)+
007500  000000                          HLT                     ;ERROR! MTPI DID NOT LOAD NEW PC
007502                          KSI10A:
007502  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
007506  104000                          SCOPE

                        ;DM=2,PC
007510  012737  010000  177776                  MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
007516  012716  177777                          MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007522  012737  007542  000250                  MOV     #KSI11A,@#MMVEC ;LOAD MEM MGMT ERR VECTOR
007530  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
007534  006627                  KSI11:  MTPI    (PC)+           ;(PC)++←(KSP)+, SHOULD ABORT
007536  000000                          HLT                     ;ERROR! DID NOT ABORT AND PC DID NOT
                                                                ;AUTO INCREMENT
007540  000000                          HLT                     ;ERROR! DID NOT ABORT
007542                          KSI11A:
007542  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
007546  022706  001056                          CMP     #KPTR-2,KSP     ;CHECK THAT STACK PTR WAS PUSHED TWICE
007552  001401                                  BEQ     .+4
007554  000000                                  HLT                     ;ERROR! INCORRECT STACK PTR
007556  012737  000512  000250                  MOV     #MMERR,@#MMVEC
007564  104000                                  SCOPE
```

```
                                ;DM=3,PC
007566  012737  014000  177776            MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007574  012716  177777                    MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
007600  005037  017000                    CLR     @#PHYS
007604  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
007610  006637  040000            KSI12:  MTPI    @#VIRT          ;VIRT+(KSP)+
007614  016700  170156                    MOV     PSW,R10         ;SAVE STATUS RESULT
007620  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
007624  122700  004010                    CMPB    #REG+N,R10      ;CHECK STATUS RESULT
007630  001401                            BEQ     .+4
007632  000000                            HLT                     ;ERROR!  INCORRECT STATUS RESULT
007634  005267  007140                    INC     PHYS            ;CHECK RESULT
007640  001401                            BEQ     .+4
007642  000000                            HLT                     ;ERROR!  INCORRECT RESULT
007644  005067  170126                    CLR     PSW
007650  104000                            SCOPE

                                ;DM=4,PC
007652  012737  010000  177776            MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
007660  005016                            CLR     (KSP)           ;PUT #0 ON KERNEL STACK
007662  016702  000012                    MOV     KSI13,R2        ;SAVE MTPI INSTRUCTION
007666  012737  007704  000250            MOV     #KSI13A,@#MMVEC ;LOAD MEM MGMT ERR VECTOR
007674  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
007700  006647                    KSI13:  MTPI    -(PC)           ;-(PC)+(KSP)+, SHOULD ABORT
007702  000000                            HLT                     ;ERROR! FAILED TO ABORT
007704                          KSI13A:
007704  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
007710  010267  177764                    MOV     R2,KSI13                ;RESTORE INSTRUCTION
007714  022706  001056                    CMP     #KPTR-2,KSP     ;CHECK STACK PTR
007720  001401                            BEQ     .+4
007722  000000                            HLT                     ;ERROR! INCORRECT STACK PTR AFTER ERROR
007724  012737  000512  000250            MOV     #MMERR,@#MMVEC
007732  104000                            SCOPE

                                ;DM=6,PC
007734  012737  010340  177776            MOV     #PSM+PRTY7,@#PSW        ;KERNEL MODE!!!, PREV SUPER MODE!!
007742  005016                            CLR     (KSP)           ;PUT #0 ON KERNEL STACK
007744  012767  177777  007032            MOV     #-1,PHYS+4
007752  005237  177572                    INC     @#SR0           ;ENABLE MEM MGMT
007756  000277                            SCC
007760  006667  030020            KSI14:  MTPI    VIRT+4          ;VIRT+4+(KSP)+
007764  016703  170006                    MOV     PSW,R3          ;SAVE STATUS RESULT
007770  005037  177572                    CLR     @#SR0           ;DISABLE MEM MGMT
007774  022706  001062                    CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
010000  001401                            BEQ     .+4
010002  000000                            HLT                     ;ERROR!  INCORRECT STACK PTR
010004  122703  000345                    CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
010010  001401                            BEQ     .+4
010012  000000                            HLT                     ;ERROR!  INCORRECT STATUS RESULT
010014  005737  017004                    TST     @#PHYS+4                ;CHECK RESULT
010020  001401                            BEQ     .+4
010022  000000                            HLT                     ;ERROR!  INCORRECT RESULT
010024  104000                            SCOPE

                                ;DM=7,PC
```

```
010026  012737  010000  177776          MOV     #KM+PSM,@#PSW   ;KERNEL MODE!!!,PREV SUPER MODE!!
010034  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
010040  012737  040004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
010046  005037  017004                  CLR     @#PHYS+4        ;PRESET DATA
010052  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010056  006677  170722          KSI15:  MTPI    @TEMP           ;VIRT+4←(KSP)+
010062  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010066  005237  017004                  INC     @#PHYS+4        ;CHECK RESULT
010072  001401                          BEQ     .+4
010074  000000                          HLT                     ;ERROR INCORRECT RESULT
010076  104000                          SCOPE

                        ;CHECK THAT MTPI CAN SET SUPER STACK PTR & PUSH DATA ONTO THE SUPER STACK
010100  012737  014000  177776          MOV     #PSM+REG,@#PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
010106  012746  040000                  MOV     #VIRT,-(KSP)
010112  005046                          CLR     -(KSP)          ;PUT DATA ON THE STACK
010114  012746  040000                  MOV     #VIRT,-(KSP)
010120  012737  177777  017000          MOV     #-1,@#PHYS      ;PRESET DATA ON THE STACK
010126  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010132  006606          KSI16:  MTPI    SSP             ;SSP←(KSP)+
010134  006636                  MTPI    @(KSP)+         ;VIRT←(KSP)+
010136  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010142  106506                          MFPD    SSP             ;GET STACK PTR
010144  022716  040000                  CMP     #VIRT,(KSP)     ;CHECK THAT MTPI  SSP SET SUPER STACK PTR
010150  001401                          BEQ     .+4
010152  000000                          HLT                     ;ERROR!  MTPD  SSP FAILED TO SET STACK PTR
010154  005737  017000                  TST     @#PHYS          ;CHECK THAT MTPD  @(KSP)+ PUT COR-
010160  001401                          BEQ     .+4             ;RECT DATA ON THE SUPER STACK
010162  000000                          HLT                     ;ERROR! MTPD  @(KSP)+ FAILED
010164  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK KERNEL STACK PTR
010170  001401                          BEQ     .+4
010172  000000                          HLT
010174  104000                          SCOPE                   ;ERROR! INCORRECT STACK PTR AFTER TEST
```

```
                                ;TESTS KUIO-KUI16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV USER MODE.
                                ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
010176  012737  030340  177776        MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
010204  005016                        CLR     (KSP)                   ;PUT #0 ON KERNEL STACK
010206  012702  177777                MOV     #-1,R2                  ;PRESET REGISTER
010212  005237  177572                INC     @#SR0                   ;ENABLE MEM MGMT
010216  006602                KUIO:   MTPI    R2                      ;R2←(KSP)+
010220  016703  167552                MOV     PSW,R3                  ;SAVE STATUS RESULT
010224  005037  177572                CLR     @#SR0                   ;DISABLE MEM MGMT
010230  022706  001062                CMP     #KPTR+2,KSP             ;CHECK THAT STACK POPPED
010234  001401                        BEQ     .+4
010236  000000                        HLT                             ;ERROR!  INCORRECT STACK PTR
010240  122703  000344                CMPB    #PRTY7+Z,R3             ;CHECK STATUS RESULT
010244  001401                        BEQ     .+4
010246  000000                        HLT                             ;ERROR! INCORRECT STATUS RESULT
010250  005702                        TST     R2                      ;CHECK RESULT
010252  001401                        BEQ     .+4
010254  000000                        HLT                             ;ERROR!  INCORRECT RESULT
010256  104000                        SCOPE

                                ;TEST THAT KERNEL CAN LOAD USER 'I' ADDRESS (VIRT)
                                ;DM=1

        120000                  VIRT=120000     ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
        017200                  PHYS=17200      ;CORRESPONDING PHYSICAL 'I' ADDRESS

010260  012737  030000  177776        MOV     #KM+PUM,@#PSW           ;KERNEL MODE!!!,PREV USER MODE!!
010266  005016                        CLR     (KSP)                   ;PUT #0 ON KERNEL STACK
010270  012702  120000                MOV     #VIRT,R2                ;R2=VIRT ADDRESS
010274  012737  177777  017200        MOV     #-1,@#PHYS              ;PRESET DATA
010302  005237  177572                INC     @#SR0                   ;ENABLE MEM MGMT
010306  000277                        SCC
010310  006612                KUI1:   MTPI    (R2)                    ;VIRT←(KSP)+
010312  016703  167460                MOV     PSW,R3                  ;SAVE STATUS RESULT
010316  005037  177572                CLR     @#SR0                   ;DISABLE MEM MGMT
010322  022706  001062                CMP     #KPTR+2,KSP             ;CHECK THAT STACK POPPED
010326  001401                        BEQ     .+4
010330  000000                        HLT                             ;ERROR! INCORRECT STACK PTR
010332  122703  000005                CMPB    #Z+C,R3                 ;CHECK STATUS RESULT
010336  001401                        BEQ     .+4
010340  000000                        HLT                             ;ERROR! INCORRECT STATUS RESULT
010342  005737  017200                TST     @#PHYS                  ;CHECK RESULT
010346  001401                        BEQ     .+4
010350  000000                        HLT                             ;ERROR! INCORRECT RESULT
010352  104000                        SCOPE

                                ;DM=2
010354  012737  034000  177776        MOV     #PUM+REG,@#PSW          ;KERNEL MODE!!!,PREV USER MODE!!
010362  012716  177777                MOV     #-1,(KSP)               ;PUT #-1 ON KERNEL STACK
010366  012702  120000                MOV     #VIRT,R12               ;R12=VIRT ADDRESS
010372  005037  017200                CLR     @#PHYS                  ;PRESET DATA
010376  005237  177572                INC     @#SR0                   ;ENABLE MEM MGMT
010402  006622                KUI2:   MTPI    (R12)+                  ;VIRT←(KSP)+
010404  005037  177572                CLR     @#SR0                   ;DISABLE MEM MGMT
```

```
010410  005237  017200                  INC     @#PHYS          ;CHECK RESULT
010414  001401                          BEQ     .+4
010416  000000                          HLT                     ;ERROR! INCORRECT RESULT
010420  022702  120002                  CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
010424  001401                          BEQ     .+4
010426  000000                          HLT                     ;ERROR! AUTO-INCREMENT FAILED
010430  005067  167342                  CLR     PSW
010434  104000                          SCOPE
                        ;DM=3
010436  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
010444  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
010450  012702  001004                  MOV     #TEMP,R2        ;LOAD INDIRECT ADDRESS
010454  012712  120004                  MOV     #VIRT+4,(R2)    ;LOAD ADDRESS
010460  005037  017204                  CLR     @#PHYS+4        ;PRESET DATA
010464  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010470  006632                  KUI3:   MTPI    @(R2)+          ;VIRT+4+(KSP)+
010472  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010476  005237  017204                  INC     @#PHYS+4                ;CHECK RESULT
010502  001401                          BEQ     .+4
010504  000000                          HLT                     ;ERROR! INCORRECT RESULT
010506  104000                          SCOPE
                        ;DM=4
010510  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
010516  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
010520  012704  120002                  MOV     #VIRT+2,R4      ;LOAD ADDRESS
010524  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET DATA
010532  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010536  006644                  KUI4:   MTPI    -(R4)           ;VIRT+(KSP)+
010540  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010544  022704  120000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
010550  001401                          BEQ     .+4
010552  000000                          HLT                     ;ERROR! AUTO-DECREMENT FAILED
010554  005737  017200                  TST     @#PHYS          ;CHECK RESULT
010560  001401                          BEQ     .+4
010562  000000                          HLT                     ;ERROR! INCORRECT RESULT
010564  104000                          SCOPE
                        ;DM=5
010566  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
010574  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
010600  012702  001010                  MOV     #TEMP+4,R12     ;LOAD INDIRECT ADDRESS
010604  012767  120000  170174          MOV     #VIRT,TEMP+2    ;LOAD ADDRESS
010612  005037  017200                  CLR     @#PHYS          ;PRESET DATA
010616  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010622  006652                  KUI5:   MTPI    @-(R12)         ;VIRT+(KSP)+
010624  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010630  005237  017200                  INC     @#PHYS          ;CHECK RESULT
010634  001401                          BEQ     .+4
010636  000000                          HLT                     ;ERROR! INCORRECT RESULT
010640  005067  167132                  CLR     PSW
010644  104000                          SCOPE
                        ;DM=6
010646  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
010654  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
```

```
010656  012702  000002                  MOV     #2,R12          ;LOAD INDEX REGISTER
010662  012767  177777  006312          MOV     #-1,PHYS+2      ;PRESET DATA
010670  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010674  006662  120000          KUI6:   MTPI    VIRT(R12)       ;VIRT+2←(KSP)+
010700  016700  167072                  MOV     PSW,R10         ;SAVE STATUS RESULT
010704  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
010710  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK POINTER POPPED
010714  001401                          BEQ     .+4
010716  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
010720  122700  004004                  CMPB    #REG+Z,R10      ;CHECK STATUS RESULT
010724  001401                          BEQ     .+4
010726  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
010730  005737  017202                  TST     @#PHYS+2                ;CHECK RESULT
010734  001401                          BEQ     .+4
010736  000000                          HLT                     ;ERROR! INCORRECT RESULT
010740  104000                          SCOPE

                        ;DM=7
010742  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
010750  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
010754  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
010760  012737  120000  001010          MOV     #VIRT,@#TEMP+4  ;LOAD ADDRESS
010766  005037  017200                  CLR     @#PHYS          ;PRESET DATA
010772  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
010776  006672  001006          KUI7:   MTPI    @TEMP+2(R2)     ;VIRT←(KSP)+
011002  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011006  005237  017200                  INC     @#PHYS          ;CHECK RESULT
011012  001401                          BEQ     .+4
011014  000000                          HLT                     ;ERROR! INCORRECT RESULT
011016  104000                          SCOPE

                        ;TEST THAT MTPI CAN LOAD USER 'I' SPACE
                        ;DM=0,PC
011020  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
011026  012716  011042                  MOV     #KUI10A,(KSP)   ;PUT NEW PC ON STACK AS DATA
011032  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011036  006607          KUI10:  MTPI    PC                      ;PC←(KSP)+
011040  000000                  HLT                             ;ERROR! MTPI DID NOT LOAD NEW PC
011042                  KUI10A:
011042  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011046  104000                          SCOPE

                        ;DM=2,PC
011050  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
011056  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
011062  012737  011102  000250          MOV     #KUI11A,@#MMVEC ;LOAD MEM MGMT ERR VECTOR
011070  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011074  006627          KUI11:  MTPI    (PC)+                   ;(PC)+←(KSP)+, SHOULD ABORT
011076  000000                  HLT                             ;ERROR! DID NOT ABORT AND PC DID NOT
                                                                ;AUTO-INCREMENT
011100  000000                  HLT                             ;ERROR! DID NOT ABORT
011102                  KUI11A:
011102  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011106  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK THAT STACK PTR WAS PUSHED TWICE
011112  001401                          BEQ     .+4
011114  000000                          HLT                     ;ERROR! INCORRECT STACK PTR ON ERROR ABORT
```

```
011116  012737  000512  000250          MOV     #MMERR,@#MMVEC
011124  104000                          SCOPE

                                ;DM=3,PC
011126  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
011134  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
011140  005037  017200                  CLR     @#PHYS
011144  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011150  006637  120000          KUI12:  MTPI    @#VIRT          ;VIRT+(KSP)+
011154  016700  166616                  MOV     PSW,R10         ;SAVE STATUS RESULT
011160  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011164  122700  004010                  CMPB    #REG+N,R10      ;CHECK STATUS RESULT
011170  001401                          BEQ     .+4
011172  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
011174  005267  006000                  INC     PHYS            ;CHECK RESULT
011200  001401                          BEQ     .+4
011202  000000                          HLT                     ;ERROR!  INCORRECT RESULT
011204  005067  166566                  CLR     PSW
011210  104000                          SCOPE

                                ;DM=4,PC
011212  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
011220  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
011222  016702  000012                  MOV     KUI13,R2        ;SAVE MTPI INSTRUCTION
011226  012737  011244  000250          MOV     #KUI13A,@#MMVEC ;LOAD MEM MGMT ERR VECTOR
011234  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011240  006647                  KUI13:  MTPI    -(PC)           ;-(PC)+(KSP)+
011242  000000                          HLT                     ;ERROR! FAILED TO ABORT
011244                          KUI13A:
011244  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011250  010267  177764                  MOV     R2,KUI13        ;RESTORE INSTRUCTION
011254  012737  000512  000250          MOV     #MMERR,@#MMVEC
011262  104000                          SCOPE

                                ;DM=6,PC
011264  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!,PREV USER MODE!!
011272  005016                          CLR     (KSP)           ;PUT #0 ON KERNEL STACK
011274  012767  177777  005702          MOV     #-1,PHYS+4
011302  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011306  000277                          SCC
011310  006667  106470          KUI14:  MTPI    VIRT+4          ;VIRT+4+(KSP)+
011314  016703  166456                  MOV     PSW,R3          ;SAVE STATUS RESULT
011320  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011324  022706  001062                  CMP     #KPTR+2,KSP     ;CHECK THAT STACK PTR POPPED
011330  001401                          BEQ     .+4
011332  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
011334  122703  000345                  CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
011340  001401                          BEQ     .+4
011342  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
011344  005737  017204                  TST     @#PHYS+4        ;CHECK RESULT
011350  001401                          BEQ     .+4
011352  000000                          HLT                     ;ERROR!  INCORRECT RESULT
011354  104000                          SCOPE

                                ;DM=7,PC
```

```
011356  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!,PREV USER MODE!!
011364  012716  177777                  MOV     #-1,(KSP)       ;PUT #-1 ON KERNEL STACK
011370  012737  120004  001004          MOV     #VIRT+4,@#TEMP  ;LOAD ADDRESS
011376  005037  017204                  CLR     @#PHYS+4                ;PRESET DATA
011402  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011406  006677  167372          KUI15:  MTPI    @TEMP           ;VIRT+4+(KSP)+
011412  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011416  005237  017204                  INC     @#PHYS+4                ;CHECK RESULT
011422  001401                          BEQ     .+4
011424  000000                          HLT                     ;ERROR INCORRECT RESULT
011426  104000                          SCOPE


                        ;CHECK THAT MTPI CAN SET USER STACK PTR & PUSH DATA ONTO USER STACK
011430  012737  034000  177776          MOV     #PUM+REG,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
011436  012746  120000                  MOV     #VIRT,-(KSP)
011442  005046                          CLR     -(KSP)          ;PUT DATA ON YHE STACK
011444  012746  120000                  MOV     #VIRT,-(KSP)
011450  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET STACK DATA
011456  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011462  006606                  KUI16:  MTPI    USP             ;USP+(KSP)+
011464  006636                          MTPI    @(KSP)+         ;VIRT+(KSP)+
011466  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011472  106506                          MFPD    USP             ;GET USER STACK PTR
011474  022716  120000                  CMP     #VIRT,(KSP)     ;CEHECK THAT MTPI  USP SET USER STACK PTR
011500  001401                          BEQ     .+4
011502  000000                          HLT                     ;ERROR! MTPI  USP FAILED
011504  005737  017200                  TST     @#PHYS          ;CHECK THAT MTPI  @(KSP)+ PUT THE
011510  001401                          BEQ     .+4             ;CORRECT DATA ONTO THE USER STACK
011512  000000                          HLT                     ;ERROR! MTPI  @(KSP)+ FAILED
011514  022706  001056                  CMP     #KPTR-2,KSP     ;CHECK KERNEL STACK PTR AFTER TEST
011520  001401                          BEQ     .+4
011522  000000                          HLT                     ;ERROR! INCORRECT KERNEL STACK PTR
011524  104000                          SCOPE
```

```
                                ;BEGIN TESTING IN SUPERVISORY MODE
                                ;NOTE: ALL HLT (HALT) INSTRUCTIONS WILL TRAP TO LOC 4. THE PROGRAM WILL
                                ;ALLOW THE TRAP,ADJUST THE PC AND RETURN TO THE HLT IN KERNEL MODE. THE
                                ;SUPERVISORY STACK POINTER IS NOT AFFECTED BY THIS TRAP. THE SUPERVISORY
                                ;STACK POINTER IS AT PHYSICAL 0600


                                ;START TESTS IN SUPERVISORY MODE
                                ;LOAD SUPERVISORY MEM MGMT REGISTERS AS REQUIRED FOR TESTS.
011526  012737  046016  172200          MOV     #115*400-400+DWN+RW,@#SIPDR0    ;LOAD SIPDR0 RW,DWN 115 BLOCKS
011534  012737  004006  172220          MOV     #11*400-400+UP+RW,@#SDPDR0      ;LOAD SDPDR0 RW,UP 11 BLOCKS
011542  012737  077406  172236          MOV     #200*400-400+UP+RW,@#SDPDR7     ;LOAD SDPDR7 RW,UP 200 BLOCKS
011550  012767  007600  160520          MOV     #7600,SDPAR7    ;I/O PAGE

                                ;TESTS SS0-SS10 TEST THE MTPD INSTRUCTION IN SUPERVISORY MODE, PREV SUPERVISORY MODE.
        020000                  VIRT=20000              ;SUPERVISOR VIRTUAL 'D' ADDRESS FOR THESE TESTS
        017100                  PHYS=17100              ;CORRESPONDING SUPER PHYSICAL 'D' ADDRESS

                                ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)
011556  012737  050340  177776          MOV     #SM+PSM+PRTY7,@#PSW     ;SUPER MODE!!!,PREV SUPER MODE!!
011564  005016                  CLR     (SSP)                   ;PUT #0 ON SUPER STACK
011566  012702  177777          MOV     #-1,R2                  ;PRESET REGISTER
011572  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
011576  106602          SS0:    MTPD    R2                      ;R2<-(SSP)+
011600  016703  166172          MOV     PSW,R3                  ;SAVE STATUS RESULT
011604  005037  177572          CLR     @#SR0                   ;DISABLE MEM MGMT
011610  022706  000702          CMP     #SPTR+2,SSP             ;CHECK THAT STACK POPPED
011614  001401                  BEQ     .+4
011616  000000                  HLT                             ;ERROR!  INCORRECT STACK PTR
011620  122703  000344          CMPB    #PRTY7+Z,R3             ;CHECK STATUS RESULT
011624  001401                  BEQ     .+4
011626  000000                  HLT                             ;ERROR! INCORRECT STATUS RESULT
011630  005702                  TST     R2                      ;CHECK RESULT
011632  001401                  BEQ     .+4
011634  000000                  HLT                             ;ERROR!  INCORRECT RESULT
011636  104000                  SCOPE

                                ;TEST THAT SUPERVISOR CAN LOAD SUPER VIRTUAL 'D' ADDRESS (VIRT)
                                ;DM=0

011640  012737  050000  177776          MOV     #SM+PSM,@#PSW           ;SUPER MODE!!!,PREV SUPER MODE!!
011646  005016                  CLR     (SSP)                   ;PUT #0 ON SUPER STACK
011650  012702  020000          MOV     #VIRT,R2                ;R2=VIRT ADDRESS
011654  012737  177777  017100  MOV     #-1,@#PHYS              ;PRESET DATA
011662  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
011666  000277                  SCC
011670  106612          SS1:    MTPD    (R2)                    ;VIRT<-(SSP)+
011672  016703  166100          MOV     PSW,R3                  ;SAVE STATUS RESULT
011676  005037  177572          CLR     @#SR0                   ;DISABLE MEM MGMT
011702  022706  000702          CMP     #SPTR+2,SSP             ;CHECK THAT STACK POPPED
011706  001401                  BEQ     .+4
011710  000000                  HLT                             ;ERROR! INCORRECT STACK PTR
011712  122703  000005          CMPB    #Z+C,R3                 ;CHECK STATUS RESULT
011716  001401                  BEQ     .+4
011720  000000                  HLT                             ;ERROR! INCORRECT STATUS RESULT
```

```
011722  005737  017100                  TST     @#PHYS          ;CHECK RESULT
011726  001401                          BEQ     .+4
011730  000000                          HLT                     ;ERROR! INCORRECT RESULT
011732  104000                          SCOPE

                                ;DM=3
011734  012737  050340  177776          MOV     #SM+PSM+PRTY7,@#PSW     ;SUPER MODE!!!,PREV SUPER MODE!!
011742  012716  177777                  MOV     #-1,(SSP)       ;PUT #-1 ON SUPER STACK
011746  012702  020000                  MOV     #VIRT,R2        ;LOAD INDIRECT ADDRESS
011752  012737  020004  017100          MOV     #VIRT+4,@#PHYS  ;LOAD ADDRESS
011760  005037  017104                  CLR     @#PHYS+4        ;PRESET DATA
011764  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
011770  106632                  SS2:    MTPD    @(R2)+          ;VIRT+4+(SSP)+
011772  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
011776  005237  017104                  INC     @#PHYS+4                ;CHECK RESULT
012002  001401                          BEQ     .+4
012004  000000                          HLT                     ;ERROR! INCORRECT RESULT
012006  104000                          SCOPE

                                ;DM=5
012010  012737  054000  177776          MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
012016  012716  177777                  MOV     #-1,(SSP)       ;PUT #-1 ON SUPER STACK
012022  012702  020004                  MOV     #VIRT+4,R12     ;LOAD INDIRECT ADDRESS
012026  012767  020000  005046          MOV     #VIRT,PHYS+2    ;LOAD ADDRESS
012034  005037  017100                  CLR     @#PHYS          ;PRESET DATA
012040  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
012044  106652                  SS3:    MTPD    @-(R12)         ;VIRT+(SSP)+
012046  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
012052  005237  017100                  INC     @#PHYS          ;CHECK RESULT
012056  001401                          BEQ     .+4
012060  000000                          HLT                     ;ERROR! INCORRECT RESULT
012062  005067  165710                  CLR     PSW
012066  104000                          SCOPE

                                ;DM=7
012070  012737  050000  177776          MOV     #SM+PSM,@#PSW   ;SUPER MODE!!!,PREV SUPER MODE!!
012076  012716  177777                  MOV     #-1,(SSP)       ;PUT #-1 ON SUPER STACK
012102  012702  000002                  MOV     #2,R2           ;LOAD INDEX REGISTER
012106  012737  020000  017104          MOV     #VIRT,@#PHYS+4  ;LOAD ADDRESS
012114  005037  017100                  CLR     @#PHYS          ;PRESET DATA
012120  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
012124  106672  020002          SS4:    MTPD    @VIRT+2(R2)     ;VIRT+(SSP)+
012130  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
012134  005237  017100                  INC     @#PHYS          ;CHECK RESULT
012140  001401                          BEQ     .+4
012142  000000                          HLT                     ;ERROR! INCORRECT RESULT
012144  104000                          SCOPE

                                ;TEST THAT MTPD CAN LOAD SUPERVISOR 'D' SPACE
                                ;DM=1,PC
012146  012737  050000  177776          MOV     #SM+PSM,@#PSW   ;SUPER MODE!!!,PREV SUPER MODE!!
012154  012716  012174                  MOV     #SS5C,(SSP)     ;PUT 'NEW' PC ON STACK
012160  005037  012172                  CLR     @#SS5A          ;PUT HALT FOLLOWING MTPD
012164  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
012170  106607                  SS5:    MTPD    PC              ;PC+(SSP)+
012172  000000                  SS5A:   HALT                    ;ERROR!  MTPD DID NOT POP WORD OFFO
```

```
                                                                ;STACK & INTO PC
012174
012174  005037  177572                SS5C:   CLR     @#SR0           ;DISABLE MEM MGMT
012200  104000                                 SCOPE

                                        ;DM=3,PC
012202  012737  050000  177776                  MOV     #SM+PSM,@#PSW   ;SUPER MODE!!!,PREV SUPER MODE!!
012210  012716  177777                          MOV     #-1,(SSP)       ;PUT #-1 ON SUPER STACK
012214  005037  017100                          CLR     @#PHYS
012220  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
012224  106637  020000                SS6:      MTPD    @#VIRT          ;VIRT←(SSP)+
012230  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
012234  005237  017100                          INC     @#PHYS          ;CHECK THAT DATA POPPED TO
012240  001401                                  BEQ     .+4             ;CORRECT ADDRESS
012242  000000                                  HLT                     ;ERROR!
012244  104000                                  SCOPE

                                        ;DM=6,PC
012246  012737  050340  177776                  MOV     #SM+PSM+PRTY7,@#PSW     ;SUPER MODE!!!,PREV SUPER MODE!!
012254  005016                                  CLR     (SSP)           ;PUT #0 ON SUPER STACK
012256  012767  177777  004620                  MOV     #-1,PHYS+4
012264  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
012270  000277                                  SCC
012272  106667  005506                SS7:      MTPD    VIRT+4          ;VIRT+4←(SSP)+
012276  016703  165474                          MOV     PSW,R3          ;SAVE STATUS RESULT
012302  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
012306  022706  000702                          CMP     #SPTR+2,SSP     ;CHECK THAT STACK PTR POPPED
012312  001401                                  BEQ     .+4
012314  000000                                  HLT                     ;ERROR!  INCORRECT STACK PTR
012316  122703  000345                          CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
012322  001401                                  BEQ     .+4
012324  000000                                  HLT                     ;ERROR!  INCORRECT STATUS RESULT
012326  005737  017104                          TST     @#PHYS+4                ;CHECK RESULT
012332  001401                                  BEQ     .+4
012334  000000                                  HLT                     ;ERROR!  INCORRECT RESULT
012336  104000                                  SCOPE

                                        ;CHECK THAT MTPD CAN SET STACK PTR
012340  012737  054000  177776                  MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
012346  005016                                  CLR     (SSP)           ;PUT #0 ON SUPER STACK
012350  005237  177572                          INC     @#SR0           ;ENABLE MEM MGMT
012354  106606                SS10:     MTPD    SSP             ;SSP←(SSP)+
012356  005037  177572                          CLR     @#SR0           ;DISABLE MEM MGMT
012362  005706                                  TST     SSP             ;CHECK STACK PTR
012364  001401                                  BEQ     .+4
012366  000000                                  HLT                     ;ERROR!
012370  104000                                  SCOPE
```

```
                                        ;TESTS SU0-SU7 TEST THE MTPD INSTRUCTION IN SUPERVISORY MODE, PREV USER MODE.
                                        ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R12)
012372  012737  074000  177776            MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
012400  012716  177777                    MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
012404  005002                            CLR     R12                     ;PRESET REGISTER
012406  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012412  000277                            SCC
012414  106602                    SU0:    MTPD    R12                     ;R12<-(SSP)+
012416  016703  165354                    MOV     PSW,R13                 ;SAVE STATUS RESULT
012422  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012426  122703  004011                    CMPB    #REG+N+C,R13            ;CHECK STATUS RESULT
012432  001401                            BEQ     .+4
012434  000000                            HLT                             ;ERROR INCORRECT STATUS RESULT
012436  005202                            INC     R12                     ;CHECK RESULT
012440  001401                            BEQ     .+4
012442  000000                            HLT                             ;ERROR! INCORRECT RESULT
012444  104000                            SCOPE

                                        ;TEST THAT SUPERVISOR CAN LOAD USER 'D' ADDRESS (VIRT)
                                        ;DM=1

        100000                          VIRT=100000     ;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
        017300                          PHYS=17300      ;CORRESPONDING PHYSICAL 'D' ADDRESS

                                        ;DM=2
012446  012737  074000  177776            MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
012454  012716  177777                    MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
012460  012702  100000                    MOV     #VIRT,R12               ;R12=VIRT ADDRESS
012464  005037  017300                    CLR     @#PHYS                  ;PRESET DATA
012470  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012474  106622                    SU1:    MTPD    (R12)+                  ;VIRT<-(SSP)+
012476  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012502  005237  017300                    INC     @#PHYS                  ;CHECK RESULT
012506  001401                            BEQ     .+4
012510  000000                            HLT                             ;ERROR! INCORRECT RESULT
012512  022702  100002                    CMP     #VIRT+2,R12             ;CHECK AUTO-INCREMENT
012516  001401                            BEQ     .+4
012520  000000                            HLT                             ;ERROR! AUTO-INCREMENT FAILED
012522  005067  165250                    CLR     PSW
012526  104000                            SCOPE

                                        ;DM=4
012530  012737  070000  177776            MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
012536  005016                            CLR     (SSP)                   ;PUT #0 ON SUPER STACK
012540  012704  100002                    MOV     #VIRT+2,R4              ;LOAD ADDRESS
012544  012737  177777  017300            MOV     #-1,@#PHYS              ;PRESET DATA
012552  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012556  106644                    SU2:    MTPD    -(R4)                   ;VIRT<-(SSP)+
012560  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012564  022704  100000                    CMP     #VIRT,R4                        ;CHECK AUTO-DECREMENT
012570  001401                            BEQ     .+4
012572  000000                            HLT                             ;ERROR! AUTO-DECREMENT FAILED
012574  005737  017300                    TST     @#PHYS                  ;CHECK RESULT
012600  001401                            BEQ     .+4
012602  000000                            HLT                             ;ERROR! INCORRECT RESULT
012604  104000                            SCOPE
```

```
                                        ;DM=6
012606  012737  074000  177776            MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
012614  005016                            CLR     (SSP)                   ;PUT #0 ON SUPER STACK
012616  012702  000002                    MOV     #2,R12                  ;LOAD INDEX REGISTER
012622  012767  177777  004452            MOV     #-1,PHYS+2              ;PRESET DATA
012630  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012634  106662  100000          SU3:      MTPD    VIRT(R12)               ;VIRT+2+(SSP)+
012640  016700  165132                    MOV     PSW,R10                 ;SAVE STATUS RESULT
012644  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012650  022706  000702                    CMP     #SPTR+2,SSP             ;CHECK THAT STACK POINTER POPPED
012654  001401                            BEQ     .+4
012656  000000                            HLT                             ;ERROR! INCORRECT STACK PTR
012660  122700  004004                    CMPB    #REG+Z,R10              ;CHECK STATUS RESULT
012664  001401                            BEQ     .+4
012666  000000                            HLT                             ;ERROR! INCORRECT STATUS RESULT
012670  005737  017302                    TST     @#PHYS+2                        ;CHECK RESULT
012674  001401                            BEQ     .+4
012676  000000                            HLT                             ;ERROR! INCORRECT RESULT
012700  104000                            SCOPE

                                        ;TEST THAT MTPD CAN LOAD PC
                                        ;DM=0,PC
012702  012737  070000  177776            MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
012710  012716  012724                    MOV     #SU4A,(SSP)             ;PUT NEW PC ON STACK AS DATA
012714  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012720  106607          SU4:      MTPD    PC                              ;PC+(SSP)+
012722  000000                            HLT                             ;ERROR! MTPD DID NOT LOAD PC
012724                  SU4A:
012724  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012730  104000                            SCOPE

                                        ;DM=3,PC
012732  012737  074000  177776            MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
012740  012716  177777                    MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
012744  005037  017300                    CLR     @#PHYS
012750  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
012754  106637  100000          SU5:      MTPD    @#VIRT                  ;VIRT+(SSP)+
012760  016700  165012                    MOV     PSW,R10                 ;SAVE STATUS RESULT
012764  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
012770  122700  004010                    CMPB    #REG+N,R10              ;CHECK STATUS RESULT
012774  001401                            BEQ     .+4
012776  000000                            HLT                             ;ERROR!  INCORRECT STATUS RESULT
013000  005267  004274                    INC     PHYS                    ;CHECK RESULT
013004  001401                            BEQ     .+4
013006  000000                            HLT                             ;ERROR!  INCORRECT RESULT
013010  005067  164762                    CLR     PSW
013014  104000                            SCOPE
                                        ;DM=7
013016  012737  070000  177776            MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
013024  012716  177777                    MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
013030  012737  100004  001004            MOV     #VIRT+4,@#TEMP          ;LOAD ADDRESS
013036  005037  017304                    CLR     @#PHYS+4                ;PRESET DATA
013042  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
013046  106677  165732          SU6:      MTPD    @TEMP                   ;VIRT+4+(SSP)+
013052  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
```

```
013056  005237  017304                  INC     @#PHYS+4        ;CHECK RESULT
013062  001401                          BEQ     .+4
013064  000000                          HLT                     ;ERROR INCORRECT RESULT
013066  104000                          SCOPE


                                ;CHECK THAT MTPD CAN SET USER STACK PTR & PUSH DATA ONTO USER STACK
013070  012737  074000  177776          MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
013076  012746  100000                  MOV     #VIRT,-(SSP)
013102  005046                          CLR     -(SSP)  ;PUSH DATA ONTO STACK
013104  012746  100000                  MOV     #VIRT,-(SSP)
013110  012737  177777  017300          MOV     #-1,@#PHYS      ;PRESET DATA ON USER STACK
013116  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
013122  106606                SU7:      MTPD    USP             ;USP<-(SSP)+
013124  106636                          MTPD    @(SSP)+         ;VIRT<-(SSP)+
013126  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
013132  106506                          MFPD    SSP             ;GET USER STACK PTR
013134  022716  100000                  CMP     #VIRT,(SSP)     ;CHECK THAT MTPD  USP SET USER STACK PTR
013140  001401                          BEQ     .+4
013142  000000                          HLT                     ;ERROR!
013144  005737  017300                  TST     @#PHYS          ;CHECK THAT MTPD  @(SSP)+ PUT THE
013150  001401                          BEQ     .+4             ;CORRECT DATA ONTO THE USER STACK
013152  000000                          HLT                     ;ERROR! MTPD  @(SSP)+ FAILED
013154  022706  000676                  CMP     #SPTR-2,SSP     ;CHECK SUPER STACK PTR AFTER TEST
013160  001401                          BEQ     .+4
013162  000000                          HLT                     ;ERROR! INCORRECT SUPER STACK PTR
013164  104000                          SCOPE

                                ;CHECK MTPD USING STACK PTR ADDRESS MODE 2
013166  012737  070000  177776          MOV     #SM+PUM,@#PSW   ;SUPER MODE!!!,PREV USER MODE!!
013174  012746  100000                  MOV     #VIRT,-(SSP)    ;PUSH ADDRESS ONTO STACK
013200  012746  177777                  MOV     #-1,-(SSP)      ;PUSH #-1 ONTO STACK
013204  005037  017300                  CLR     @#PHYS          ;CLEAR USER DEST ADDRESS
013210  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
013214  106636                SU10:     MTPD    @(SSP)+         ;MOVES -1 TO VIRT
013216  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
013222  022706  000700                  CMP     #SPTR,SSP       ;CHECK SUPER STACK PTR
013226  001401                          BEQ     .+4
013230  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
013232  005237  017300                  INC     @#PHYS          ;CHECK THAT CORRECT DATA WAS MOVED
013236  001401                          BEQ     .+4             ;ONTO STACK
013240  000000                          HLT                     ;ERROR! INCORRECT DATA MOVED
013242  106506                          MFPD    USP             ;GET USER STACK PTR
013244  022716  000600                  CMP     #UPTR,(SSP)     ;CHECK THAT USER STACK PTR WAS NOT
013250  001401                          BEQ     .+4             ;CHANGED
013252  000000                          HLT                     ;ERROR! INCORRECT USP
013254  104000                          SCOPE
```

```
                                        ;TESTS SSI0-SSI5 TEST THE MTPI INSTRUCTION IN SUPER MODE, PREV SUPER MODE.
                                        ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R12)
013256  012737  054000  177776          MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
013264  012716  177777                  MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
013270  005002                          CLR     R12                     ;PRESET REGISTER
013272  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
013276  000277                          SCC
013300  006602                          MTPI    R12                     ;R12,(SP)+
013302  016703  164470                  MOV     PSW,R13                 ;SAVE STATUS RESULT
013306                          SSI0:
013306  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
013312  122703  004011                  CMPB    #REG+N+C,R13            ;CHECK STATUS RESULT
013316  001401                          BEQ     .+4
013320  000000                          HLT                             ;ERROR INCORRECT STATUS RESULT
013322  005202                          INC     R12                     ;CHECK RESULT
013324  001401                          BEQ     .+4
013326  000000                          HLT                             ;ERROR! INCORRECT RESULT
013330  104000                          SCOPE

                                        ;TEST THAT SUPERVISOR CAN LOAD SUPERVISOR 'I' ADDRESS (VIRT)
                                        ;DM=2

        040000                          VIRT=40000      ;SUPER VIRTUAL 'I' ADDRESS FOR THESE TESTS
        017000                          PHYS=17000      ;CORRESPONDING PHYSICAL 'I' ADDRESS (VIRT)

                                        ;DM=2
013332  012737  054000  177776          MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
013340  012716  177777                  MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
013344  012702  040000                  MOV     #VIRT,R12               ;R12=VIRT ADDRESS
013350  005037  017000                  CLR     @#PHYS                  ;PRESET DATA
013354  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
013360  006622                  SSI1:   MTPI    (R12)+                  ;VIRT←(SSP)+
013362  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
013366  005237  017000                  INC     @#PHYS                  ;CHECK RESULT
013372  001401                          BEQ     .+4
013374  000000                          HLT                             ;ERROR! INCORRECT RESULT
013376  022702  040002                  CMP     #VIRT+2,R12             ;CHECK AUTO-INCREMENT
013402  001401                          BEQ     .+4
013404  000000                          HLT                             ;ERROR! AUTO-INCREMENT FAILED
013406  005067  164364                  CLR     PSW
013412  104000                          SCOPE
                                        ;DM=4
013414  012737  050000  177776          MOV     #SM+PSM,@#PSW           ;SUPER MODE!!!,PREV SUPER MODE!!
013422  005016                          CLR     (SSP)                   ;PUT #0 ON SUPER STACK
013424  012704  040002                  MOV     #VIRT+2,R4              ;LOAD ADDRESS
013430  012737  177777  017000          MOV     #-1,@#PHYS              ;PRESET DATA
013436  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
013442  006644                  SSI2:   MTPI    -(R4)                   ;VIRT←(SSP)+
013444  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
013450  022704  040000                  CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
013454  001401                          BEQ     .+4
013456  000000                          HLT                             ;ERROR! AUTO-DECREMENT FAILED
013460  005737  017000                  TST     @#PHYS                  ;CHECK RESULT
013464  001401                          BEQ     .+4
013466  000000                          HLT                             ;ERROR! INCORRECT RESULT
```

```
013470  104000                          SCOPE

                                ;DM=6
013472  012737  054000  177776    MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
013500  005016                    CLR     (SSP)                   ;PUT #0 ON SUPER STACK
013502  012702  000002            MOV     #2,R12                  ;LOAD INDEX REGISTER
013506  012767  177777  003266    MOV     #-1,PHYS+2              ;PRESET DATA
013514  005237  177572            INC     @#SRO                   ;ENABLE MEM MGMT
013520  006662  040000  SSI3:     MTPI    VIRT(R12)               ;VIRT+2←(SSP)+
013524  016700  164246            MOV     PSW,R10                 ;SAVE STATUS RESULT
013530  005037  177572            CLR     @#SRO                   ;DISABLE MEM MGMT
013534  022706  000702            CMP     #SPTR+2,SSP             ;CHECK THAT STACK POINTER POPPED
013540  001401                    BEQ     .+4
013542  000000                    HLT                             ;ERROR! INCORRECT STACK PTR
013544  122700  004004            CMPB    #REG+Z,R10              ;CHECK STATUS RESULT
013550  001401                    BEQ     .+4
013552  000000                    HLT                             ;ERROR! INCORRECT STATUS RESULT
013554  005737  017002            TST     @#PHYS+2                ;CHECK RESULT
013560  001401                    BEQ     .+4
013562  000000                    HLT                             ;ERROR! INCORRECT RESULT
013564  104000                    SCOPE


                                ;TEST THAT MTPI CAN LOAD SUPER 'I' SPACE
                                ;DM=3,PC
013566  012737  054000  177776    MOV     #SM+PSM+REG,@#PSW       ;SUPER MODE!!!,PREV SUPER MODE!!
013574  012716  177777            MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
013600  005037  017000            CLR     @#PHYS
013604  005237  177572            INC     @#SRO                   ;ENABLE MEM MGMT
013610  006637  040000  SSI4:     MTPI    @#VIRT                  ;VIRT←(SSP)+
013614  016700  164156            MOV     PSW,R10                 ;SAVE STATUS RESULT
013620  005037  177572            CLR     @#SRO                   ;DISABLE MEM MGMT
013624  122700  004010            CMPB    #REG+N,R10              ;CHECK STATUS RESULT
013630  001401                    BEQ     .+4
013632  000000                    HLT                             ;ERROR! INCORRECT STATUS RESULT
013634  005267  003140            INC     PHYS                    ;CHECK RESULT
013640  001401                    BEQ     .+4
013642  000000                    HLT                             ;ERROR! INCORRECT RESULT
013644  005067  164126            CLR     PSW
013650  104000                    SCOPE

013652  012737  050000  177776    MOV     #SM+PSM,@#PSW           ;SUPER MODE!!!,PREV SUPER MODE!!
013660  012716  177777            MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
013664  012737  040004  001004    MOV     #VIRT+4,@#TEMP          ;LOAD ADDRESS
013672  005037  017004            CLR     @#PHYS+4                ;PRESET DATA
013676  005237  177572            INC     @#SRO                   ;ENABLE MEM MGMT

013702  006677  165076  SSI5:     MTPI    @TEMP                   ;VIRT+4←(SSP)+
013706  005037  177572            CLR     @#SRO                   ;DISABLE MEM MGMT
013712  005237  017004            INC     @#PHYS+4                        ;CHECK RESULT
013716  001401                    BEQ     .+4
013720  000000                    HLT                             ;ERROR INCORRECT RESULT
013722  104000                    SCOPE

                                ;TESTS SU0-SU10 TEST THE MTPI INSTRUCTION IN SUPER MODE, PREV USER MODE.
                                ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
```

```
013724  012737  070340  177776          MOV     #SM+PUM+PRTY7,@#PSW     ;SUPER MODE!!!, PREV USER MODE!!
013732  005016                          CLR     (SSP)                   ;PUT #0 ON SUPER STACK
013734  012702  177777                  MOV     #-1,R2                  ;PRESET REGISTER
013740  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
013744  006602                  SUI0:   MTPI    R2                      ;R2<-(SSP)+
013746  016703  164024                  MOV     PSW,R3                  ;SAVE STATUS RESULT
013752  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
013756  022706  000702                  CMP     #SPTR+2,SSP             ;CHECK THAT STACK POPPED
013762  001401                          BEQ     .+4
013764  000000                          HLT                             ;ERROR! INCORRECT STACK PTR
013766  122703  000344                  CMPB    #PRTY7+Z,R3             ;CHECK STATUS RESULT
013772  001401                          BEQ     .+4
013774  000000                          HLT                             ;ERROR! INCORRECT STATUS RESULT
013776  005702                          TST     R2                      ;CHECK RESULT
014000  001401                          BEQ     .+4
014002  000000                          HLT                             ;ERROR! INCORRECT RESULT
014004  104000                          SCOPE

                                ;TEST THAT SUPER CAN LOAD USER 'I' ADDRESS (VIRT)
                                ;DM=1

        120000                          VIRT=120000     ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
        017200                          PHYS=17200      ;CORRESPONDING PHYSICAL 'I' ADDRESS

014006  012737  070000  177776          MOV     #SM+PUM,@#PSW   ;SUPER MODE!!!,PREV USER MODE!!
014014  005016                          CLR     (SSP)           ;PUT #0 ON SUPER STACK
014016  012702  120000                  MOV     #VIRT,R2        ;R2=VIRT ADDRESS
014022  012737  177777  017200          MOV     #-1,@#PHYS      ;PRESET DATA
014030  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
014034  000277                          SCC
014036  006612                  SUI1:   MTPI    (R2)            ;VIRT<-(SSP)+
014040  016703  163732                  MOV     PSW,R3          ;SAVE STATUS RESULT
014044  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
014050  022706  000702                  CMP     #SPTR+2,SSP     ;CHECK THAT STACK POPPED
014054  001401                          BEQ     .+4
014056  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
014060  122703  000005                  CMPB    #Z+C,R3         ;CHECK STATUS RESULT
014064  001401                          BEQ     .+4
014066  000000                          HLT                     ;ERROR! INCORRECT STATUS RESULT
014070  005737  017200                  TST     @#PHYS          ;CHECK RESULT
014074  001401                          BEQ     .+4
014076  000000                          HLT                     ;ERROR! INCORRECT RESULT
014100  104000                          SCOPE
```

```
                                        ;DM=3
014102  012737  070340  177776           MOV     #SM+PUM+PRTY7,@#PSW     ;SUPER MODE!!!, PREV USER MODE!!
014110  012716  177777                   MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
014114  012702  001004                   MOV     #TEMP,R2                ;LOAD INDIRECT ADDRESS
014120  012712  120004                   MOV     #VIRT+4,(R2)            ;LOAD ADDRESS
014124  005037  017204                   CLR     @#PHYS+4                ;PRESET DATA
014130  005237  177572                   INC     @#SR0                   ;ENABLE MEM MGMT
014134  006632                 SUI2:     MTPI    @(R2)+                  ;VIRT+4+(SSP)+
014136  005037  177572                   CLR     @#SR0                   ;DISABLE MEM MGMT
014142  005037  177572                   CLR     @#SR0                   ;DISABLE MEM MGMT
014146  005237  017204                   INC     @#PHYS+4                ;CHECK RESULT
014152  001401                           BEQ     .+4
014154  000000                           HLT                             ;ERROR! INCORRECT RESULT
014156  104000                           SCOPE

                                        ;DM=5
014160  012737  074000  177776           MOV     #SM+PUM+REG,@#PSW       ;SUPER MODE!!!,PREV USER MODE!!
014166  012716  177777                   MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
014172  012702  001010                   MOV     #TEMP+4,R12             ;LOAD INDIRECT ADDRESS
014176  012767  120000  164602           MOV     #VIRT,TEMP+2            ;LOAD ADDRESS
014204  005037  017200                   CLR     @#PHYS                  ;PRESET DATA
014210  005237  177572                   INC     @#SR0                   ;ENABLE MEM MGMT
014214  006652                 SUI3:     MTPI    @-(R12)                 ;VIRT+(SSP)+
014216  005037  177572                   CLR     @#SR0                   ;DISABLE MEM MGMT
014222  005237  017200                   INC     @#PHYS                  ;CHECK RESULT
014226  001401                           BEQ     .+4
014230  000000                           HLT                             ;ERROR! INCORRECT RESULT
014232  005067  163540                   CLR     PSW
014236  104000                           SCOPE

                                        ;DM=7
014240  012737  070000  177776           MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
014246  012716  177777                   MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
014252  012702  000002                   MOV     #2,R2                   ;LOAD INDEX REGISTER
014256  012737  120000  001010           MOV     #VIRT,@#TEMP+4          ;LOAD ADDRESS
014264  005037  017200                   CLR     @#PHYS                  ;PRESET DATA
014270  005237  177572                   INC     @#SR0                   ;ENABLE MEM MGMT
014274  006672  001006         SUI4:     MTPI    @TEMP+2(R2)             ;VIRT+(SSP)+
014300  005037  177572                   CLR     @#SR0                   ;DISABLE MEM MGMT
014304  005237  017200                   INC     @#PHYS                  ;CHECK RESULT
014310  001401                           BEQ     .+4
014312  000000                           HLT                             ;ERROR! INCORRECT RESULT
014314  104000                           SCOPE

                                        ;DM=2,PC
014316  012737  070000  177776           MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
014324  012716  177777                   MOV     #-1,(SSP)               ;PUT #-1 ON SUPER STACK
014330  005037  014356                   CLR     @#SUI6+2                ;CLEAR ADRS FOLLOWING MTPI
014334  012767  014362  163706           MOV     #SUI6A,MMVEC            ;SET MEM MGMT ERROR VECTOR
014342  016767  163430  163702           MOV     PSW,MMVEC+2             ;LOAD 'NEW' PSW TO BE IN SUPER MODE
014350  005237  177572                   INC     @#SR0                   ;ENABLE MEM MGMT
014354  006627                 SUI6:     MTPI    (PC)+                   ;(PC)+-(SSP)+, SHOULD ABORT
014356  000000                           HLT                             ;ERROR! DID NOT ABORT AND PC DID NOT
                                                                         ;AUTO-INCREMENT
```

```
014360  000000                          HLT                             ;ERROR! DID NOT ABORT
014362                          SUI6A:
014362  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
014366  022706  000676                  CMP     #SPTR-2,SSP             ;CHECK STACK PTR
014372  001401                          BEQ     .+4
014374  000000                          HLT                             ;ERROR! STACK PTR NOT PUSHED TWICE ON ERROR
014376  104000                          SCOPE

                                ;DM=4,PC
014400  012737  070000  177776          MOV     #SM+PUM,@#PSW           ;SUPER MODE!!!,PREV USER MODE!!
014406  012716  000401                  MOV     #401,(SSP)              ;PUT BR .+4 ON STACK AS DATA
014412  016702  000012                  MOV     SUI7,R2                 ;SAVE MTPI INSTRUCTION
014416  012767  014434  163624          MOV     #SUI7A,MMVEC            ;LOAD MEM MGMT ERR VECTOR
014424  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
014430  006647                  SUI7:   MTPI    -(PC)                   ;-(PC)+(SSP)+ SHOULD ABORT
014432  000000                          HLT                             ;ERROR! FAILED TO ABORT
014434                          SUI7A:
014434  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
014440  010267  177764                  MOV     R2,SUI7                 ;RESTORE INSTRUCTION
014444  022706  000676                  CMP     #SPTR-2,SSP             ;CHECK STACK PTR
014450  001401                          BEQ     .+4
014452  000000                          HLT                             ;ERROR! INCORRECT STACK PTR AFTER ERROR
014454  012767  000512  163566          MOV     #MMERR,MMVEC
014462  005037  000252                  CLR     @#MMVEC+2
014466  104000                          SCOPE
```

```
                                        ;DM=6,PC
014470  012737  070340  177776            MOV     #SM+PUM+PRTY7,@#PSW     ;SUPER MODE!!!, PREV USER MODE!!
014476  005016                            CLR     (SSP)                   ;PUT #0 ON SUPER STACK
014500  012767  177777  002476            MOV     #-1,PHYS+4
014506  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
014512  000277                            SCC
014514  006667  103264          SUI10:    MTPI    VIRT+4                  ;VIRT+4+(SSP)+
014520  016703  163252                    MOV     PSW,R3                  ;SAVE STATUS RESULT
014524  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
014530  022706  000702                    CMP     #SPTR+2,SSP             ;CHECK THAT STACK PTR POPPED
014534  001401                            BEQ     .+4
014536  000000                            HLT                             ;ERROR! INCORRECT STACK PTR
014540  122703  000345                    CMPB    #PRTY7+Z+C,R3           ;CHECK STATUS RESULT
014544  001401                            BEQ     .+4
014546  000000                            HLT                             ;ERROR! INCORRECT STATUS RESULT
014550  001401                            BEQ     .+4                     ;CHECK RESULT
014552  000000                            HLT                             ;ERROR! INCORRECT RESULT
014554  104000                            SCOPE

                                        ;CHECK MTPD SUPER MODE, PREVIOUS KERNEL MODE
014556  012737  040000  177776            MOV     #SM,@#PSW               ;SUPER MODE!!!, PREV KERNEL MODE!!
014564  012746  140076                    MOV     #140076,-(SSP)          ;PUT ADDRESS ON THE STACK
014570  005046                            CLR     -(SSP)                  ;PUT DATA ON THE STACK
014572  012737  177777  016776            MOV     #-1,@#16776             ;PRESET CORRESPONDING PHYS ADDRESS
014600  005237  177572                    INC     @#SR0                   ;ENABLE MEM MGMT
014604  106676  000000          SK0:      MTPD    @(SSP)                  ;LOAD KERNEL SPACE FROM SUPER STACK
014610  005037  177572                    CLR     @#SR0                   ;DISABLE MEM MGMT
014614  005737  016776                    TST     @#16776                 ;CHECK DATA
014620  001401                            BEQ     .+4
014622  000000                            HLT                             ;ERROR! INCORRECT DATA IN KERNEL SPACE
014624  022706  000676                    CMP     #SPTR-2,SSP             ;CHECK SUPER STACK PTR
014630  001401                            BEQ     .+4
014632  000000                            HLT                             ;ERROR! INCORRECT SUPER STACK PTR
014634  104000                            SCOPE
```

```
                                        ;BEGIN TESTING IN USER MODE
                                        ;NOTE: ALL HLT (HALT) INSTRUCTIONS WILL TRAP TO LOC 4. THE PROGRAM WILL
                                        ;ALLOW THE TRAP,ADJUST THE PC AND RETURN TO THE HLT IN KERNEL MODE. THE
                                        ;USER STACK POINTER IS NOT AFFECTED BY THIS TRAP. THE USER STACK POINTER
                                        ;IS AT PHYSICAL 0600.

                                        ;SETUP USER MEM MGMT REGISTERS FOR THE TEST.
014636  012737  062416  177600                MOV     #146*400-400+DWN+RW,@#UIPDR0    ;LOAD UIPDR0 RW,DWN 146 BLOCKS
014644  012737  004006  177620                MOV     #11*400-400+UP+RW,@#UDPDR0      ;LOAD UDPDR0 RW,UP 11 BLOCKS
014652  012737  077406  177636                MOV     #200*400-400+UP+RW,@#UDPDR7     ;LOAD UDPDR7 RW,UP 200 BLOCKS
014660  012767  007600  163010                MOV     #7600,UDPAR7

                                        ;TESTS UU0-UU11 TEST THE MTPD INSTRUCTION IN USER MODE, PREV USER MODE.

                                        ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER
014666  012737  174000  177776                MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
014674  012716  177777                        MOV     #-1,(USP)
014700  005002                                CLR     R12                     ;PRESET REGISTER
014702  005237  177572                        INC     @#SR0                   ;ENABLE MEM MGMT
014706  000277                                SCC
014710  106602                        UU0:    MTPD    R12                     ;R12<-(USP)+
014712  016703  163060                        MOV     PSW,R13                 ;SAVE STATUS RESULT
014716  005037  177572                        CLR     @#SR0                   ;DISABLE MEM MGMT
014722  122703  004011                        CMPB    #REG+N+C,R13            ;CHECK STATUS RESULT
014726  001401                                BEQ     .+4
014730  000000                                HLT                             ;ERROR INCORRECT STATUS RESULT
014732  005202                                INC     R12                     ;CHECK RESULT
014734  001401                                BEQ     .+4
014736  000000                                HLT                             ;ERROR! INCORRECT RESULT
014740  104000                                SCOPE

                                        ;TEST THAT USER CAN LOAD USER VIRTUAL 'D' ADDRESS (VIRT)
                                        ;DM=1

        100000                          VIRT=100000     ;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
        017300                          PHYS=17300      ;CORRESPONDING PHYSICAL 'D' ADDRESS

014742  012737  170000  177776                MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
014750  005016                                CLR     (USP)
014752  012702  100000                        MOV     #VIRT,R2                        ;R2=VIRT ADDRESS
014756  012737  177777  017300                MOV     #-1,@#PHYS      ;PRESET DATA
014764  005237  177572                        INC     @#SR0           ;ENABLE MEM MGMT
014770  000277                                SCC
014772  106612                        UU1:    MTPD    (R2)            ;VIRT<-(USP)+
014774  016703  162776                        MOV     PSW,R3          ;SAVE STATUS RESULT
015000  005037  177572                        CLR     @#SR0           ;DISABLE MEM MGMT
015004  022706  000602                        CMP     #UPTR+2,USP     ;CHECK THAT STACK POPPED
015010  001401                                BEQ     .+4
015012  000000                                HLT                     ;ERROR! INCORRECT STACK PTR
015014  122703  000005                        CMPB    #Z+C,R3         ;CHECK STATUS RESULT
015020  001401                                BEQ     .+4
015022  000000                                HLT                     ;ERROR! INCORRECT STATUS RESULT
015024  005737  017300                        TST     @#PHYS          ;CHECK RESULT
015030  001401                                BEQ     .+4
015032  000000                                HLT                     ;ERROR! INCORRECT RESULT
```

```
015034  104000                          SCOPE

                                ;DM=3
015036  012737  170340  177776  MOV     #UM+PUM+PRTY7,@#PSW     ;USER MODE!!!, PREV USER MODE!!
015044  012716  177777          MOV     #-1,(USP)
015050  012702  100000          MOV     #VIRT,R2                ;LOAD INDIRECT ADDRESS
015054  012737  100004  017300  MOV     #VIRT+4,@#PHYS          ;LOAD ADDRESS
015062  005037  017304          CLR     @#PHYS+4                ;PRESET DATA
015066  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
015072  106632          UU3:    MTPD    @(R2)+                  ;VIRT+4+(USP)+
015074  005037  177572          CLR     @#SR0                   ;DISABLE MEM MGMT
015100  005237  017304          INC     @#PHYS+4                ;CHECK RESULT
015104  001401                  BEQ     .+4
015106  000000                  HLT                             ;ERROR! INCORRECT RESULT
015110  104000                  SCOPE

                                ;DM=5
015112  012737  174000  177776  MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
015120  012716  177777          MOV     #-1,(USP)
015124  012702  100004          MOV     #VIRT+4,R12             ;LOAD INDIRECT ADDRESS
015130  012767  100000  002144  MOV     #VIRT,PHYS+2            ;LOAD ADDRESS
015136  005037  017300          CLR     @#PHYS                  ;PRESET DATA
015142  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
015146  106652          UU4:    MTPD    @-(R12)                 ;VIRT+(USP)+
015150  005037  177572          CLR     @#SR0                   ;DISABLE MEM MGMT
015154  005237  017300          INC     @#PHYS                  ;CHECK RESULT
015160  001401                  BEQ     .+4
015162  000000                  HLT                             ;ERROR! INCORRECT RESULT
015164  005067  162606          CLR     PSW
015170  104000                  SCOPE

                                ;DM=7
015172  012737  170000  177776  MOV     #UM+PUM,@#PSW           ;USER MODE!!!,PREV USER MODE!!
015200  012716  177777          MOV     #-1,(USP)
015204  012702  000002          MOV     #2,R2                   ;LOAD INDEX REGISTER
015210  012737  100000  017304  MOV     #VIRT,@#PHYS+4          ;LOAD ADDRESS
015216  005037  017300          CLR     @#PHYS                  ;PRESET DATA
015222  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
015226  106672  100002  UU5:    MTPD    @VIRT+2(R2)             ;VIRT+(USP)+
015232  005037  177572          CLR     @#SR0                   ;DISABLE MEM MGMT
015236  005237  017300          INC     @#PHYS                  ;CHECK RESULT
015242  001401                  BEQ     .+4
015244  000000                  HLT                             ;ERROR! INCORRECT RESULT
015246  104000                  SCOPE

                        ;TEST THAT MTPD CAN LOAD USER 'D' SPACE

                                ;DM=2,PC
015250  012737  170000  177776  MOV     #UM+PUM,@#PSW           ;USER MODE!!!,PREV USER MODE!!
015256  012716  177777          MOV     #-1,(USP)
015262  005067  000022          CLR     UU6A
015266  012737  015314  000250  MOV     #UU6B,@#MMVEC
015274  016737  162476  000252  MOV     PSW,@#MMVEC+2
015302  005237  177572          INC     @#SR0                   ;ENABLE MEM MGMT
015306  106627          UU6:    MTPD    (PC)+                   ;(PC)++(USP)+
015310  000000          UU6A:   0                               ;ERROR! DID NOT ABORT & PC DID NOT AUTO-
```

```
                                                                ;INCREMENT
015312  000000                          HLT                     ;ERROR! DID NOT ABORT
015314                          UU6B:
015314  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
015320  022706  000576                  CMP     #UPTR-2,USP     ;CHECK USER STACK PTR
015324  001401                          BEQ     .+4
015326  000000                          HLT                     ;ERROR! INCORRECT USER STACK PTR
015330  104000                          SCOPE

                                ;DM=4,PC
015332  012737  174000  177776          MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
015340  005016                          CLR     (USP)
015342  013702  015366                  MOV     @#UU7,R12       ;SAVE MTPD INSTRUCTION
015346  012737  015372  000250          MOV     #UU7A,@#MMVEC
015354  016737  162416  000252          MOV     PSW,@#MMVEC+2
015362  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
015366  106647                  UU7:    MTPD    -(PC)           ;-(PC)+(USP)+
                                ;IF PROGRAM HALTS AT UU7 THEN ABORT DID NOT TAKE PLACE
015370  000000                          HALT                    ;ERROR! DID NOT ABORT & PC DID NOT
                                                                ;AUTO-DECREMENT
015372                          UU7A:
015372  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
015376  010267  177764                  MOV     R12,UU7         ;RESTORE INSTRUCTION
015402  022706  000576                  CMP     #UPTR-2,USP     ;CHECK STACK PTR
015406  001401                          BEQ     .+4
015410  000000                          HLT                     ;ERROR! INCORRECT STACK PTR
015412  012737  000512  000250          MOV     #MMERR,@#MMVEC
015420  005037  000252                  CLR     @#MMVEC+2
015424  104000                          SCOPE

                                ;DM=6,PC
015426  012737  170340  177776          MOV     #UM+PUM+PRTY7,@#PSW     ;USER MODE!!!, PREV USER MODE!!
015434  005016                          CLR     (USP)
015436  012767  177777  001640          MOV     #-1,PHYS+4
015444  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
015450  000277                          SCC
015452  106667  062326          UU10:   MTPD    VIRT+4          ;VIRT+4+(USP)+
015456  016703  162314                  MOV     PSW,R3          ;SAVE STATUS RESULT
015462  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
015466  022706  000602                  CMP     #UPTR+2,USP     ;CHECK THAT STACK PTR POPPED
015472  001401                          BEQ     .+4
015474  000000                          HLT                     ;ERROR!  INCORRECT STACK PTR
015476  122703  000345                  CMPB    #PRTY7+Z+C,R3   ;CHECK STATUS RESULT
015502  001401                          BEQ     .+4
015504  000000                          HLT                     ;ERROR!  INCORRECT STATUS RESULT
015506  005737  017304                  TST     @#PHYS+4                ;CHECK RESULT
015512  001401                          BEQ     .+4
015514  000000                          HLT                     ;ERROR!  INCORRECT RESULT
015516  104000                          SCOPE

                                ;CHECK THAT MTPD CAN SET STACK PTR
015520  012737  174000  177776          MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
015526  005016                          CLR     (USP)
015530  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
015534  106606                  UU11:   MTPD    USP             ;USP+(USP)+
015536  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
```

```
015542  005706                  TST     USP             ;CHECK STACK PTR
015544  001401                  BEQ     .+4
015546  000000                  HLT                     ;ERROR!
015550  104000                  SCOPE
```

```
                                ;TESTS UUI0-UUI6 TEST THE MTPI INSTRUCTION IN USER MODE, PREV USER MODE.
                                ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
015552  012737  170340  177776        MOV     #UM+PUM+PRTY7,@#PSW     ;USER MODE!!!, PREV USER MODE!!
015560  005016                        CLR     (USP)
015562  012702  177777                MOV     #-1,R2          ;PRESET REGISTER
015566  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
015572  006602                UUI0:   MTPI    R2              ;R2<-(USP)+
015574  016703  162176                MOV     PSW,R3          ;SAVE STATUS RESULT
015600  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
015604  022706  000602                CMP     #UPTR+2,USP     ;CHECK THAT STACK POPPED
015610  001401                        BEQ     .+4
015612  000000                        HLT                     ;ERROR!  INCORRECT STACK PTR
015614  122703  000344                CMPB    #PRTY7+Z,R3     ;CHECK STATUS RESULT
015620  001401                        BEQ     .+4
015622  000000                        HLT                     ;ERROR! INCORRECT STATUS RESULT
015624  005702                        TST     R2              ;CHECK RESULT
015626  001401                        BEQ     .+4
015630  000000                        HLT                     ;ERROR!  INCORRECT RESULT
015632  104000                        SCOPE

                                ;TEST THAT USER CAN LOAD USER 'I' ADDRESS (VIRT)

        120000                          VIRT=120000     ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
        017200                          PHYS=17200      ;CORRESPONDING PHYSICAL 'I' ADDRESS

                                ;DM=2
015634  012737  174000  177776        MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
015642  012716  177777                MOV     #-1,(USP)
015646  012702  120000                MOV     #VIRT,R12       ;R12=VIRT ADDRESS
015652  005037  017200                CLR     @#PHYS          ;PRESET DATA
015656  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
015662  006622                UUI1:   MTPI    (R12)+          ;VIRT<-(USP)+
015664  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
015670  005237  017200                INC     @#PHYS          ;CHECK RESULT
015674  001401                        BEQ     .+4
015676  000000                        HLT                     ;ERROR! INCORRECT RESULT
015700  022702  120002                CMP     #VIRT+2,R12     ;CHECK AUTO-INCREMENT
015704  001401                        BEQ     .+4
015706  000000                        HLT                     ;ERROR! AUTO-INCREMENT FAILED
015710  005067  162062                CLR     PSW
015714  104000                        SCOPE
                                ;DM=4
015716  012737  170000  177776        MOV     #UM+PUM,@#PSW   ;USER MODE!!!,PREV USER MODE!!
015724  005016                        CLR     (USP)
015726  012704  120002                MOV     #VIRT+2,R4      ;LOAD ADDRESS
015732  012737  177777  017200        MOV     #-1,@#PHYS      ;PRESET DATA
015740  005237  177572                INC     @#SR0           ;ENABLE MEM MGMT
015744  006644                UUI2:   MTPI    -(R4)           ;VIRT<-(USP)+
015746  005037  177572                CLR     @#SR0           ;DISABLE MEM MGMT
015752  022704  120000                CMP     #VIRT,R4                ;CHECK AUTO-DECREMENT
015756  001401                        BEQ     .+4
015760  000000                        HLT                     ;ERROR! AUTO-DECREMENT FAILED
015762  005737  017200                TST     @#PHYS          ;CHECK RESULT
015766  001401                        BEQ     .+4
015770  000000                        HLT                     ;ERROR! INCORRECT RESULT
```

```
015772  104000                          SCOPE

                                ;DM=6
015774  012737  174000  177776          MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
016002  005016                          CLR     (USP)
016004  012702  000002                  MOV     #2,R12                  ;LOAD INDEX REGISTER
016010  012767  177777  001164          MOV     #-1,PHYS+2              ;PRESET DATA
016016  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
016022  006662  120000          UUI3:   MTPI    VIRT(R12)               ;VIRT+2←(USP)+
016026  016700  161744                  MOV     PSW,R10                 ;SAVE STATUS RESULT
016032  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
016036  022706  000602                  CMP     #UPTR+2,USP             ;CHECK THAT STACK POINTER POPPED
016042  001401                          BEQ     .+4
016044  000000                          HLT                             ;ERROR! INCORRECT STACK PTR
016046  122700  004004                  CMPB    #REG+Z,R10              ;CHECK STATUS RESULT
016052  001401                          BEQ     .+4
016054  000000                          HLT                             ;ERROR! INCORRECT STATUS RESULT
016056  005737  017202                  TST     @#PHYS+2                        ;CHECK RESULT
016062  001401                          BEQ     .+4
016064  000000                          HLT                             ;ERROR! INCORRECT RESULT
016066  104000                          SCOPE

                                ;TEST THAT MTPI CAN LOAD PC
                                ;DM=0,PC
016070  012737  170000  177776          MOV     #UM+PUM,@#PSW           ;USER MODE!!!,PREV USER MODE!!
016076  012716  016112                  MOV     #UUI4A,(USP)            ;PUT NEW PC ON STACK AS DATA
016102  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
016106  006607                  UUI4:   MTPI    PC                      ;PC←(USP)+
016110  000000                          HLT                             ;ERROR! MTPI DID NOT LOAD PC
016112                          UUI4A:
016112  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
016116  104000                          SCOPE

                                ;DM=3,PC
016120  012737  174000  177776          MOV     #UM+PUM+REG,@#PSW       ;USER MODE!!!, PREV USER MODE!!
016126  012716  177777                  MOV     #-1,(USP)
016132  005037  017200                  CLR     @#PHYS
016136  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
016142  006637  120000          UUI5:   MTPI    @#VIRT                  ;VIRT←(USP)+
016146  016700  161624                  MOV     PSW,R10                 ;SAVE STATUS RESULT
016152  005037  177572                  CLR     @#SR0                   ;DISABLE MEM MGMT
016156  122700  004010                  CMPB    #REG+N,R10              ;CHECK STATUS RESULT
016162  001401                          BEQ     .+4
016164  000000                          HLT                             ;ERROR!  INCORRECT STATUS RESULT
016166  005267  001006                  INC     PHYS                    ;CHECK RESULT
016172  001401                          BEQ     .+4
016174  000000                          HLT                             ;ERROR!  INCORRECT RESULT
016176  005067  161574                  CLR     PSW
016202  104000                          SCOPE

                                ;DM=7,PC
016204  012737  170000  177776          MOV     #UM+PUM,@#PSW           ;USER MODE!!!,PREV USER MODE!!
016212  012716  177777                  MOV     #-1,(USP)
016216  012737  120004  001004          MOV     #VIRT+4,@#TEMP          ;LOAD ADDRESS
016224  005037  017204                  CLR     @#PHYS+4                ;PRESET DATA
016230  005237  177572                  INC     @#SR0                   ;ENABLE MEM MGMT
```

```
016234  006677  162544          UUI6:   MTPI    @TEMP           ;VIRT+4+(USP)+
016240  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
016244  005237  017204                  INC     @#PHYS+4        ;CHECK RESULT
016250  001401                          BEQ     .+4
016252  000000                          HLT                     ;ERROR INCORRECT RESULT
016254  104000                          SCOPE


                                ;CHECK MTPI USER MODE, PREVIOUS SUPER MODE
016256  012737  150000  177776          MOV     #UM+PSM,@#PSW   ;USER MODE!!!, PREV SUPER MODE!!
016264  012746  040076                  MOV     #40076,-(USP)   ;LOAD ADDRESS ON THE STACK
016270  005046                          CLR     -(USP)          ;PUT DATA ON THE STACK
016272  012737  177777  017076          MOV     #-1,@#17076     ;PRESET PHYSICAL ADDRESS
016300  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT
016304  006676  000000          USI0:   MTPI    @(USP)          ;LOAD DATA INTO SUPER 'I' SPACE FROM
                                                                ;USER STACK
016310  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT
016314  005737  017076                  TST     @#17076         ;CHECK DATA
016320  001401                          BEQ     .+4
016322  000000                          HLT                     ;ERROR! INCORRECT DATA IN SUPER 'I' SPACE
016324  022706  000576                  CMP     #UPTR-2,USP     ;CHECK USER STACK PTR
016330  001401                          BEQ     .+4
016332  000000                          HLT                     ;ERROR! INCORRECT USP
016334  104000                          SCOPE

                                ;*******************IMPORTANT NOTE************************
                                ;NO CODE ALLOWED BETWEEN 16600-17776

016336  005267  162436          END:    INC     ICNT            ;INCREMENT PASS COUNT
016342  026727  162432  004200          CMP     ICNT,#4200
016350  001402                          BEQ     DONE
016352  000167  162520                  JMP     BEGIN
016356  012767  000007  161202  DONE:   MOV     #7,TPB          ;RING BELL AFTER 1000
016364  105767  161174                  TSTB    TPS             ;PASSES
016370  100375                          BPL     .-4
016372  013702  000042                  MOV     @#42,R2 ;GET DECTAPE MONITOR RETURN ADDRESS
016376  001404                          BEQ     DONE1           ;BRANCH IF (42)=0
016400  004712                          JSR     7,(2)           ;RETURN TO MONITOR
016402  000240                          NOP                     ;ACT11
016404  000240                          NOP                     ;OVERLAY
016406  000240                          NOP                     ;AREA
016410  000167  162454          DONE1:  JMP     START           ;RESTART

        000001                          .END
```

```
ABIT   = 000200            485#
AVA    = 020000            336#
BEGIN    001076            555#   3020
BIT13  = 020000            311#
BIT14  = 040000            310#
BIT15  = 100000            309#
BIT6   = 000100            313#
BIT8   = 000400            312#    531
C      = 000001            260#    639    793    841    867   1048   1103   1129   1308   1390   1556   1603   1629
                          1806   1890   2064   2161   2249   2279   2441   2577   2678   2725   2751   2855
DEC1   = 000370            343#
DEC2   = 000360            344#
DM     = 000400            332#
DONE     016356           3019   3021#
DONE1    016410           3025   3030#
DR0    = 000000            345#
DR1    = 000400            346#
DR2    = 001000            347#
DR3    = 001400            348#
DR4    = 002000            349#
DR5    = 002400            350#
DR6    = 003000            351#
DR7    = 003400            352#
DS     = 000020            326#   1028
DWN    = 000010            484#   2118   2709
ED     = 000010            482#
EMTVEC= 000030             282#    501
END      016336           3017#
ENMM   = 000001            317#
ERRVEC= 000004             277#    499
HLT    = 000000            490#    612    615    618    638    641    644    657    660    674    686    689    702
                           717    720    723    736    749    756    761    774    777    792    795    798    812
                           824    843    846    866    869    872    885    888    902    915    918    932    947
                           950    953    967    976    989    991    996   1011   1014   1024   1027   1030   1047
                          1050   1053   1066   1082   1085   1088   1105   1108   1128   1131   1134   1147   1150
                          1164   1177   1180   1194   1209   1212   1215   1229   1238   1250   1252   1257   1271
                          1274   1286   1292   1307   1310   1313   1326   1343   1346   1349   1366   1369   1372
                          1389   1392   1395   1408   1411   1425   1437   1440   1454   1469   1472   1475   1488
                          1513   1526   1529   1555   1558   1561   1576   1588   1605   1608   1628   1631   1634
                          1647   1650   1664   1677   1680   1694   1709   1712   1715   1729   1738   1749   1751
                          1756   1770   1773   1784   1790   1805   1808   1811   1825   1841   1844   1847   1862
                          1865   1868   1889   1892   1895   1908   1911   1925   1938   1941   1955   1970   1973
                          1976   1990   1999   2010   2012   2017   2031   2034   2045   2063   2066   2069   2083
                          2100   2103   2106   2137   2140   2143   2160   2163   2166   2180   2194   2209   2234
                          2248   2251   2254   2265   2281   2284   2303   2306   2320   2323   2337   2340   2343
                          2352   2367   2370   2383   2400   2403   2406   2419   2422   2426   2443   2446   2465
                          2468   2481   2484   2498   2501   2504   2519   2522   2536   2550   2553   2556   2576
                          2579   2582   2598   2612   2627   2638   2640   2645   2655   2661   2677   2680   2682
                          2695   2698   2727   2730   2750   2753   2756   2770   2784   2799   2814   2819   2838
                          2854   2857   2860   2871   2886   2889   2892   2911   2914   2927   2930   2944   2947
                          2950   2959   2974   2977   2991   3007   3010
IC     = 000200            331#
ICNT     001000            543#    553*    560   3017*   3018
INC1   = 000010            341#
INC2   = 000020            342#
IOTVEC= 000020             280#
```

```
IS     = 000000            327#
KDE    = 000004            357#    563
KDPAR0= 172360             464#    589*
KDPAR1= 172362             465#
KDPAR2= 172364             466#
KDPAR3= 172366             467#
KDPAR4= 172370             468#
KDPAR5= 172372             469#
KDPAR6= 172374             470#    590*
KDPAR7= 172376             471#    591*
KDPDR0= 172320             446#    580*
KDPDR1= 172322             447#
KDPDR2= 172324             448#
KDPDR3= 172326             449#
KDPDR4= 172330             450#
KDPDR5= 172332             451#
KDPDR6= 172334             452#    581*
KDPDR7= 172336             453#    582*
KIPAR0= 172340             455#    588*
KIPAR1= 172342             456#
KIPAR2= 172344             457#
KIPAR3= 172346             458#
KIPAR4= 172350             459#
KIPAR5= 172352             460#
KIPAR6= 172354             461#
KIPAR7= 172356             462#
KIPDR0= 172300             437#    579*
KIPDR1= 172302             438#
KIPDR2= 172304             439#
KIPDR3= 172306             440#
KIPDR4= 172310             441#
KIPDR5= 172312             442#
KIPDR6= 172314             443#
KIPDR7= 172316             444#
KKI0    005444            1361#
KKI1    005530            1384#
KKI10   006242            1496#
KKI10A  006244            1494*   1497#
KKI10B  006226            1493#   1500
KKI11   006276            1508#
KKI11A  006300            1506*   1509#
KKI12   006342            1521#
KKI13   006426            1536    1538#   1541*
KKI14   006470            1550#
KKI15   006564            1572#
KKI16   006622            1584#
KKI2    005622            1404#
KKI3    005712            1421#
KKI4    005752            1433#
KKI5    006036            1450#
KKI6    006110            1464#
KKI7    006204            1484#
KKO     001356             607#
KK1     001442             633#
KK10    002152             743#
KK10A   002154             744#
```

```
KK10B   002156          741    745#
KK11    002206          755#
KK11A   002212          756#
KK11B   002214          753    757#
KK12    002254          769#
KK13    002342          787#
KK14    002432          808#
KK15    002470          820#
KK2     001534          653#
KK3     001624          670#
KK4     001664          682#
KK5     001750          698#
KK6     002022          712#
KK7     002116          732#
KM    = 000000          268#   855   906   957   972   982  1019  1057  1117  1168  1219  1234  1244
                       1279   1317  1331  1617  1668  1719  1734  1744  1778  1816  1878  1929  1980
                       1995   2005  2039  2074
KPG   = 000000          330#
KPTR  = 001060          301#   522   557   610   636   715   747   759   790   825   864   945   994
                       1025   1045  1086  1126  1207  1255  1290  1305  1347  1364  1387  1467  1553
                       1589   1626  1707  1754  1788  1803  1845  1860  1887  1968  2015  2061  2104
KSI0    006666          1600#
KSI1    006750          1623#
KSI10   007476          1737#
KSI10A  007502          1735   1739#
KSI11   007534          1748#
KSI11A  007542          1746   1752#
KSI12   007610          1765#
KSI13   007700          1780   1783#  1787*
KSI13A  007704          1781   1785#
KSI14   007760          1800#
KSI15   010056          1821#
KSI16   010132          1835#
KSI2    007042          1643#
KSI3    007130          1660#
KSI4    007176          1673#
KSI5    007262          1690#
KSI6    007334          1704#
KSI7    007436          1725#
KSP   =%000006          255#   511*  512   514*  516*  521   522*  523*  524*  525*  526*  557*  604*
                        610   628*  636   649*  665*  678*  693*  708*  715   727*  747   759   766*
                        783*  790   803*  818*  820*  822   825*  834*  856*  864   877*  893*  907*
                        923*  938*  945   958*  973*  983*  994  1003*  1025  1038*  1045  1058*  1071*
                       1072*  1073*  1077*  1080  1086  1096*  1118*  1126  1139*  1155*  1169*  1185*  1200*
                       1207   1220*  1235*  1245*  1255  1263*  1280*  1290  1298*  1305  1318*  1332*  1333*
                       1334*  1338*  1341  1347  1358*  1364  1379*  1387  1400*  1416*  1429*  1445*  1460*
                       1467   1479*  1493*  1505*  1518*  1535*  1546*  1553  1567*  1582*  1584*  1586  1589*
                       1596*  1618*  1626  1639*  1655*  1669*  1685*  1700*  1707  1720*  1735*  1745*  1754
                       1762*  1779*  1788  1796*  1803  1817*  1830*  1831*  1832*  1836*  1839  1845  1854*
                       1860   1879*  1887  1900*  1916*  1930*  1946*  1961*  1968  1981*  1996*  2006*  2015
                       2023*  2040*  2054*  2061  2075*  2089*  2090*  2091*  2095*  2098  2104
KS0     002534          838#
KS1     002616          861#
KS10    003344          975#
KS10A   003350          973    977#
KS11    003412          984*   988#
```

DCKTDA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
KS11A   003420            985    992#
KS12    003466           1006#
KS13    003554           1020   1023#   1032*
KS13A   003560           1021   1025#
KS14    003646           1042#
KS15    003744           1062#
KS16    004020           1076#
KS2     002710            881#
KS3     002776            898#
KS4     003044            911#
KS5     003130            928#
KS6     003202            942#
KS7     003304            963#
KUI0    010216           1857#
KUI1    010310           1884#
KUI10   011036           1998#
KUI10A  011042           1996   2000#
KUI11   011074           2009#
KUI11A  011102           2007   2013#
KUI12   011150           2026#
KUI13   011240           2041   2044#   2048*
KUI13A  011244           2042   2046#
KUI14   011310           2058#
KUI15   011406           2079#
KUI16   011462           2094#
KUI2    010402           1904#
KUI3    010470           1921#
KUI4    010536           1934#
KUI5    010622           1951#
KUI6    010674           1965#
KUI7    010776           1986#
KU0     004106           1100#
KU1     004170           1123#
KU10    004716           1237#  1246*
KU10A   004722           1235   1239#
KU11    004760           1249#
KU11A   004766           1247   1253#
KU12    005034           1266#
KU13    005126           1282   1285#   1289*
KU13A   005132           1287#
KU14    005204           1302#
KU15    005302           1322#
KU16    005356           1337#
KU2     004262           1143#
KU3     004350           1160#
KU4     004416           1173#
KU5     004502           1190#
KU6     004554           1204#
KU7     004656           1225#
LIGHTS= 177570            298#  560*
MMERR   000512            504   537#   561    997   1033   1258   1757   1791   2018   2049   2662   2839
MMK     001202            578#
MMT   = 010000            335#
MMVEC = 000250            286#  503    539    561*  562*  741*  753*  985*  986*  997*  1021*  1033*  1247*
                         1258*  1746*  1757*  1781*  1791*  2007*  2018*  2042*  2049*  2634*  2635*  2652*  2662*
                         2663*  2808*  2809*  2826*  2827*  2839*  2840*
```

DCKTDA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
MMO     001144          566#
N     = 000010          263#   772    841   1009   1103   1269   1524   1603   1768   2029   2279   2365   2441
                       2517   2725   2972
NOP   = 000240          489#
NRA   = 100000          338#  1028
NR0   = 000000          474#
NR3   = 000003          477#
NR7   = 000007          481#
OST   = 004000          334#
PC    =x000007          246#   743*   975*   988*  1023*  1237*  1249*  1280   1285*  1496*  1508*  1538*  1737*
                       1748*  1783*  1998*  2009*  2044*  2218*  2351*  2637*  2654*  2811*  2829*  2958*
PFVEC = 000024          281#
PHYS  = 017200          626#   630*   642    651*   655*   667*   668*   672*   680*   687    695*   696*   700*
                        710*   721    729*   730*   734*   767*   775*   784*   796    804*   805*   810*   853#
                        858*   870    879*   883*   896*   900*   909*   916    926*   930*   940*   951    961*
                        965*  1004*  1012*  1039*  1051   1060*  1064*  1074*  1083   1115#  1120*  1132   1141*
                       1145*  1158*  1162*  1171*  1178   1188*  1192*  1202*  1213   1223*  1227*  1264*  1272*
                       1299*  1311   1320*  1324*  1335*  1344   1354#  1381*  1393   1402*  1406*  1419*  1423*
                       1431*  1438   1448*  1452*  1462*  1473   1482*  1486*  1519*  1527*  1547*  1559   1569*
                       1574*  1615#  1620*  1632   1641*  1645*  1658*  1662*  1671*  1678   1688*  1692*  1702*
                       1713   1723*  1727*  1763*  1771*  1797*  1809   1819*  1823*  1833*  1842   1876#  1881*
                       1893   1902*  1906*  1919*  1923*  1932*  1939   1949*  1953*  1963*  1974   1984*  1988*
                       2024*  2032*  2055*  2067   2077*  2081*  2092*  2101   2125#  2152*  2164   2173*  2174*
                       2178*  2187*  2188*  2192*  2202*  2203*  2207*  2228*  2232*  2240*  2252   2291#  2297*
                       2301*  2314*  2321   2330*  2341   2360*  2368*  2377*  2381*  2392*  2401   2413*  2420*
                       2453#  2459*  2463*  2475*  2482   2491*  2502   2512*  2520*  2529*  2534*  2563#  2568*
                       2580   2591*  2596*  2606*  2610*  2621*  2625*  2669*  2737#  2742*  2754   2763*  2764*
                       2768*  2777*  2778*  2782*  2792*  2793*  2797*  2846*  2858   2899#  2905*  2909*  2921*
                       2928   2937*  2948   2967*  2975*  2985*  2989*
PIRQ  = 177772          291#
PIRVEC= 000240          285#
PIR4  = 010000          314#
PKM   = 000000          271#
PLA   = 040000          337#  1028
PRTY4 = 000200          266#
PRTY7 = 000340          265#   603    613    664    782    793    892   1037   1048   1154   1297   1308   1357
                       1367   1415   1545   1556   1654   1795   1806   1853   1863   1915   2053   2064   2128
                       2138   2170   2238   2249   2541   2551   2587   2667   2678   2760   2844   2855   2877
                       2887
PSM   = 010000          272#   833    855    876    892    906    922    937    957    972    982   1002   1019
                       1037   1057   1070   1595   1617   1638   1654   1668   1684   1699   1719   1734   1744
                       1761   1778   1795   1816   1829   2128   2149   2170   2184   2199   2214   2226   2238
                       2258   2432   2456   2472   2488   2510   2526   2997
PSW   = 177776          289#   527*   529*   556*   603*   608    634    648*   661*   664*   692*   703*   707*
                        713    765*   770    778*   782*   788    817*   833*   839    855*   862    876*   889*
                        892*   906*   922*   933*   937*   943    957*   972*   982*  1002*  1007   1015*  1019*
                       1037*  1043   1057*  1070*  1095*  1101   1117*  1124   1138*  1151*  1154*  1168*  1184*
                       1195*  1199*  1205   1219*  1234*  1244*  1262*  1267   1275*  1279*  1297*  1303   1317*
                       1331*  1357*  1362   1385   1399*  1412*  1415*  1444*  1455*  1459*  1465   1517*  1522
                       1530*  1534*  1545*  1551   1566*  1581*  1595*  1601   1617*  1624   1638*  1651*  1654*
                       1668*  1684*  1695*  1699*  1705   1719*  1734*  1744*  1761*  1766   1774*  1778*  1795*
                       1801   1816*  1829*  1853*  1858   1870*  1885   1899*  1912*  1915*  1929*  1945*  1956*
                       1960*  1966   1980*  1995*  2005*  2022*  2027   2035*  2039*  2053*  2059   2074*  2088*
                       2128*  2133   2149*  2156   2170*  2184*  2195*  2199*  2214*  2226*  2238*  2244   2258*
                       2271*  2277   2294*  2307*  2311*  2327*  2333   2348*  2358*  2363   2371*  2374*  2388*
                       2410*  2432*  2438   2456*  2469*  2472*  2488*  2494   2510*  2515   2523*  2526*  2541*
```

```
                    2546    2565*   2572    2587*   2602*   2613*   2617*   2631*   2635    2649*   2667*   2673    2686*
                    2717*   2723    2739*   2746    2760*   2774*   2785*   2789*   2805*   2809    2823*   2827    2844*
                    2850    2864*   2877*   2882    2902*   2915*   2918*   2934*   2940    2955*   2965*   2970    2978*
                    2982*   2997*
PUM    = 030000      273#    527     1095    1117    1138    1154    1168    1184    1199    1219    1234    1244    1262
                    1279    1297    1317    1331    1853    1878    1899    1915    1929    1945    1960    1980    1995
                    2005    2022    2039    2053    2074    2088    2271    2294    2311    2327    2348    2358    2374
                    2388    2410    2541    2565    2587    2602    2617    2631    2649    2667    2717    2739    2760
                    2774    2789    2805    2823    2844    2864    2877    2902    2918    2934    2955    2965    2982
RDO    = 000002     476#
RDOT   = 000001     475#
REG    = 004000     267#    274#    648     692     707     718     765     772     817     833     841     876     922
                    937     948     1002    1009    1070    1095    1103    1138    1184    1199    1210    1262    1269
                    1399    1444    1459    1470    1517    1524    1534    1581    1595    1603    1638    1684    1699
                    1710    1761    1768    1829    1899    1945    1960    1971    2022    2029    2088    2184    2258
                    2271    2279    2294    2327    2338    2358    2365    2388    2432    2441    2456    2488    2499
                    2510    2517    2602    2717    2725    2774    2823    2864    2902    2934    2945    2965    2972
RESVEC= 000010      278#
RW     = 000006     480#    579     580     581     582     583     584     585     586     1283    2118    2119    2120
                    2709    2710    2711
RWT    = 000004     478#
RWTW   = 000005     479#
R0     =%000000     240#
R1     =%000001     241#    521*    524
R10    =%000000     247#    713*    718     770*    772     943*    948     1007*   1009    1205*   1210    1267*   1269
                    1465*   1470    1522*   1524    1705*   1710    1766*   1768    1966*   1971    2027*   2029    2333*
                    2338    2363*   2365    2494*   2499    2515*   2517    2940*   2945    2970*   2972
R11    =%000001     248#
R12    =%000002     249#    650*    653*    658     694*    698*    709*    712*    835*    838*    844*    878*    881*
                    886     924*    928*    939*    942*    1097*   1100*   1106*   1140*   1143*   1148    1186*   1190*
                    1201*   1204*   1401*   1404*   1409    1446*   1450*   1461*   1464*   1536*   1541    1597*   1600*
                    1606*   1640*   1643*   1648    1686*   1690*   1701*   1704*   1901*   1904*   1909    1947*   1951*
                    1962*   1965*   2186*   2190*   2273*   2276*   2282*   2296*   2299*   2304    2329*   2332*   2434*
                    2437*   2444*   2458*   2461*   2466    2490*   2493*   2604*   2608*   2719*   2722*   2728*   2776*
                    2780*   2825*   2835    2904*   2907*   2912    2936*   2939*
R13    =%000003     250#    839*    841     1101*   1103    1601*   1603    2277*   2279    2438*   2441    2723*   2725
R14    =%000004     251#
R15    =%000005     252#
R2     =%000002     242#    568*    570*    572*    574*    605*    607*    616     629*    633*    666*    670*    728*
                    732*    857*    861*    894*    895*    898*    959*    963*    1020*   1032    1119*   1123*   1156*
                    1157*   1160*   1221*   1225*   1282*   1289    1359*   1361*   1370    1380*   1384*   1417*   1421*
                    1480*   1484*   1619*   1623*   1656*   1657*   1660*   1721*   1725*   1780*   1787    1855*   1857*
                    1866    1880*   1884*   1917*   1918*   1921*   1982*   1986*   2041*   2048    2130*   2132*   2141
                    2151*   2155*   2172*   2176*   2201*   2205*   2543*   2545*   2554    2567*   2571*   2589*   2590*
                    2593*   2619*   2623*   2651*   2658    2741*   2745*   2762*   2766*   2791*   2795*   2879*   2881*
                    2890    3024*
R3     =%000003     243#    569*    571*    573*    575*    608*    613     634*    639     788*    793     862*    867
                    1043*   1048    1124*   1129    1303*   1308    1362*   1367    1385*   1390    1551*   1556    1624*
                    1629    1801*   1806    1858*   1863    1885*   1890    2059*   2064    2133*   2138    2156*   2161
                    2244*   2249    2546*   2551    2572*   2577    2673*   2678    2746*   2751    2850*   2855    2882*
                    2887
R4     =%000004     244#    679*    682*    684     908*    911*    913     1170*   1173*   1175    1430*   1433*   1435
                    1670*   1673*   1675    1931*   1934*   1936    2313*   2316*   2318    2474*   2477*   2479    2920*
                    2923*   2925
R5     =%000005     245#
SCOPE  = 104000     491#    558     619     645     662     675     690     704     724     737     750     762     779
```

DCKTDA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
                      799   813   826   847   873   890   903   919   934   954   968   979   998
                     1016  1034  1054  1067  1089  1109  1135  1152  1165  1181  1196  1216  1230
                     1241  1259  1276  1294  1314  1327  1350  1373  1396  1413  1426  1441  1456
                     1476  1489  1502  1514  1531  1542  1563  1577  1590  1609  1635  1652  1665
                     1681  1696  1716  1730  1741  1758  1775  1792  1812  1826  1848  1869  1896
                     1913  1926  1942  1957  1977  1991  2002  2019  2036  2050  2070  2084  2107
                     2144  2167  2181  2196  2210  2223  2235  2255  2266  2285  2308  2324  2344
                     2355  2372  2384  2407  2427  2447  2470  2485  2505  2524  2537  2557  2583
                     2599  2614  2628  2646  2664  2683  2699  2731  2757  2771  2786  2800  2820
                     2841  2861  2872  2893  2916  2931  2951  2962  2979  2992  3011
SCOPEA  000432        502   521#
SCOPEX  000510        532   534#
SDE     = 000002      356#  563
SDPAR0= 172260        428#
SDPAR1= 172262        429#  594*
SDPAR2= 172264        430#
SDPAR3= 172266        431#
SDPAR4= 172270        432#
SDPAR5= 172272        433#
SDPAR6= 172274        434#
SDPAR7= 172276        435#  2121*
SDPDR0= 172220        410#  2119*
SDPDR1= 172222        411#   583*
SDPDR2= 172224        412#
SDPDR3= 172226        413#
SDPDR4= 172230        414#
SDPDR5= 172232        415#
SDPDR6= 172234        416#
SDPDR7= 172236        417#  2120*
SHLT    000400        500    511#
SHLTA   000422        513    516#
SIPAR0= 172240        419#
SIPAR1= 172242        420#
SIPAR2= 172244        421#  593*
SIPAR3= 172246        422#
SIPAR4= 172250        423#
SIPAR5= 172252        424#
SIPAR6= 172254        425#
SIPAR7= 172256        426#
SIPDR0= 172200        401#  572   2118*
SIPDR1= 172202        402#
SIPDR2= 172204        403#  584*
SIPDR3= 172206        404#
SIPDR4= 172210        405#
SIPDR5= 172212        406#
SIPDR6= 172214        407#
SIPDR7= 172216        408#
SKD     014604       2691#
SLR     = 177774      290#  559*
SM      = 040000      269#  2128  2149  2170  2184  2199  2214  2226  2238  2258  2271  2294  2311
                     2327  2348  2358  2374  2388  2410  2432  2456  2472  2488  2510  2526  2541
                     2565  2587  2602  2617  2631  2649  2667  2686
SPG     = 000040      329#  1028
SPTR    = 000700      302#   525  2135  2158  2246  2335  2404  2417  2496  2548  2574  2643  2659
                     2675  2696
SR0     = 177572      360#   537   538*  567*  606*  609*  631*  635*  652*  654*  669*  671*  681*
```

```
                        683*   697*   699*   711*   714*   731*   733*   742*   746*   754*   758*   768*   771*
                        785*   789*   806*   809*   819*   821*   836*   840*   859*   863*   880*   882*   897*
                        899*   910*   912*   927*   929*   941*   944*   962*   964*   974*   978*   987*   993*
                       1005*  1008*  1022*  1028   1031*  1040*  1044*  1061*  1063*  1075*  1078*  1098*  1102*
                       1121*  1125*  1142*  1144*  1159*  1161*  1172*  1174*  1189*  1191*  1203*  1206*  1224*
                       1226*  1236*  1240*  1248*  1254*  1265*  1268*  1284*  1288*  1300*  1304*  1321*  1323*
                       1336*  1339*  1360*  1363*  1382*  1386*  1403*  1405*  1420*  1422*  1432*  1434*  1449*
                       1451*  1463*  1466*  1483*  1485*  1495*  1499*  1501*  1507*  1510*  1520*  1523*  1537*
                       1540*  1548*  1552*  1570*  1573*  1583*  1585*  1598*  1602*  1621*  1625*  1642*  1644*
                       1659*  1661*  1672*  1674*  1689*  1691*  1703*  1706*  1724*  1726*  1736*  1740*  1747*
                       1753*  1764*  1767*  1782*  1786*  1798*  1802*  1820*  1822*  1834*  1837*  1856*  1859*
                       1882*  1886*  1903*  1905*  1920*  1922*  1933*  1935*  1950*  1952*  1964*  1967*  1985*
                       1987*  1997*  2001*  2008*  2014*  2025*  2028*  2043*  2047*  2056*  2060*  2078*  2080*
                       2093*  2096*  2131*  2134*  2153*  2157*  2175*  2177*  2189*  2191*  2204*  2206*  2217*
                       2222*  2229*  2231*  2241*  2245*  2260*  2262*  2274*  2278*  2298*  2300*  2315*  2317*
                       2331*  2334*  2350*  2354*  2361*  2364*  2378*  2380*  2393*  2396*  2414*  2416*  2435*
                       2440*  2460*  2462*  2476*  2478*  2492*  2495*  2513*  2516*  2530*  2533*  2544*  2547*
                       2569*  2573*  2592*  2594*  2595*  2607*  2609*  2622*  2624*  2636*  2642*  2653*  2657*
                       2670*  2674*  2690*  2692*  2720*  2724*  2743*  2747*  2765*  2767*  2779*  2781*  2794*
                       2796*  2810*  2816*  2828*  2834*  2847*  2851*  2866*  2868*  2880*  2883*  2906*  2908*
                       2922*  2924*  2938*  2941*  2957*  2961*  2968*  2971*  2986*  2988*  3001*  3004*

SROT    001002          537*   544#
SR1   = 177574          361#
SR2   = 177576          362#
SR3   = 172516          363#   563*
SSI0    013306         2439#
SSI1    013360         2461#
SSI2    013442         2477#
SSI3    013520         2493#
SSI4    013610         2514#
SSI5    013702         2532#
SSP   =%000006          256#   530*  1076*  1079   1835*  1838   2129*  2135   2150*  2158   2171*  2185*  2200*
                       2215*  2227*  2239*  2246   2259*  2261*  2263   2272*  2295*  2312*  2328*  2335   2349*
                       2359*  2375*  2389*  2390*  2391*  2395*  2397   2398   2404   2411*  2412*  2415*  2417
                       2424   2433*  2457*  2473*  2489*  2496   2511*  2527*  2542*  2548   2566*  2574   2588*
                       2603*  2618*  2632*  2643   2650*  2659   2668*  2675   2687*  2688*  2691*  2696

SS0     011576         2132#
SS1     011670         2155#
SS10    012354         2261#
SS2     011770         2176#
SS3     012044         2190#
SS4     012124         2205#
SS5     012170         2218#
SS5A    012172         2216*  2219#
SS5C    012174         2215   2221#
SS6     012224         2230#
SS7     012272         2243#
START   001070          506    552#  3030
SUI0    013744         2545#
SUI1    014036         2571#
SUI10   014514         2672#
SUI2    014134         2593#
SUI3    014214         2608#
SUI4    014274         2623#
SUI6    014354         2633*  2637#
SUI6A   014362         2634   2641#
```

```
SUI7    014430          2651    2654*   2658*
SUI7A   014434          2652    2656*
SUO     012414          2276*
SU1     012474          2299*
SU10    013214          2415*
SU2     012556          2316*
SU3     012634          2332*
SU4     012720          2351*
SU4A    012724          2349    2353*
SU5     012754          2362*
SU6     013046          2379*
SU7     013122          2394*
SWR   = 177570           297*    531     533
T     = 000020           264*
TBITVE= 000014           279*
TE    = 001000           333*
TEMP    001004           545*    894     924     925*    960*    963*   1059*   1062*   1156    1186    1187*   1222*   1225*
                        1319*   1322*   1417    1418*   1446    1447*   1481*   1484*   1568*   1572*   1656    1686    1687*
                        1722*   1725*   1818*   1821*   1917    1947    1948*   1983*   1986*   2076*   2079*   2376*   2379*
                        2528*   2532*   2589    2604    2605*   2620*   2623*   2984*   2987*
TKB   = 177562           294*
TKS   = 177560           293*
TPB   = 177566           296*   3021*
TPS   = 177564           295*   3022
TPVEC = 000064           284*
TRAPVE= 000034           283*
TOA     001336           602*
UBREAK= 177770           292*    533*
UDE   = 000001           355*    563
UDPAR0= 177660           392*
UDPAR1= 177662           393*
UDPAR2= 177664           394*
UDPAR3= 177666           395*
UDPAR4= 177670           396*    597*
UDPAR5= 177672           397*
UDPAR6= 177674           398*
UDPAR7= 177676           399*   2712*
UDPDR0= 177620           374*   1283*   1293*   2710*
UDPDR1= 177622           375*
UDPDR2= 177624           376*
UDPDR3= 177626           377*
UDPDR4= 177630           378*    585*
UDPDR5= 177632           379*
UDPDR6= 177634           380*
UDPDR7= 177636           381*   2711*
UIPAR0= 177640           383*
UIPAR1= 177642           384*
UIPAR2= 177644           385*
UIPAR3= 177646           386*
UIPAR4= 177650           387*
UIPAR5= 177652           388*    596*
UIPAR6= 177654           389*
UIPAR7= 177656           390*
UIPDR0= 177600           365*    568     2709*
UIPDR1= 177602           366*
UIPDR2= 177604           367*
```

DCKTDA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
UIPDR3= 177606            368#
UIPDR4= 177610            369#
UIPDR5= 177612            370#   586*
UIPDR6= 177614            371#
UIPDR7= 177616            372#
UM    = 140000            270#   516   2717  2739  2760  2774  2789  2805  2823  2644  2864  2877  2902
                         2918   2934  2955  2965  2982  2997
UP    = 000000            483#   579   580   581   582   583   584   585   586   1283  2119  2120  2710
                         2711
UPG   = 000140            328#
UPTR  = 000600            303#   526   2424  2748  2817  2836  2852  2884  2942  3008
USIO    016304           3002#
USP   =%000006            257#   528*  1337* 1340  2094* 2097  2394* 2423  2718* 2740* 2748  2761* 2775*
                         2790*  2806*  2817  2824*  2836  2845*  2852  2865*  2867*  2869  2878*  2884  2903*
                         2919*  2935*  2942  2956*  2966*  2983*  2998*  2999*  3002*  3008
UUIO    015572           2881#
UUI1    015662           2907#
UUI2    015744           2923#
UUI3    016022           2939#
UUI4    016106           2958#
UUI4A   016112           2956   2960#
UUI5    016142           2969#
UUI6    016234           2987#
UUO     014710           2722#
UU1     014772           2745#
UU10    015452           2849#
UU11    015534           2867#
UU3     015072           2766#
UU4     015146           2780#
UU5     015226           2795#
UU6     015306           2811#
UU6A    015310           2807*  2812#
UU6B    015314           2808   2815#
UU7     015366           2825   2829#  2835*
UU7A    015372           2826   2833#
V     = 000002            261#
VIRT  = 120000            625#   629   650   658   666   667   679   684   694   695   712*  729   732*
                          769*   787*  804   808*  852#  857   878   886   895   908   913   925   942*
                          960   1006*  1042*  1059  1071  1073  1080  1114#  1119  1140  1148  1157  1170
                         1175   1187  1204*  1222  1266*  1302*  1319  1332  1334  1341  1353#  1380  1401
                         1409   1418  1430  1435  1447  1464*  1481  1521*  1550*  1568  1614#  1619  1640
                         1648   1657  1670  1675  1687  1704*  1722  1765*  1800*  1818  1830  1832  1839
                         1875#  1880  1901  1909  1918  1931  1936  1948  1965*  1983  2026*  2058*  2076
                         2089   2091  2098  2124#  2151  2172  2173  2186  2187  2202  2205*  2230*  2243*
                         2290#  2296  2304  2313  2318  2332*  2362*  2376  2389  2391  2398  2411  2452#
                         2458   2466  2474  2479  2493*  2514*  2528  2562#  2567  2590  2605  2620  2672*
                         2736#  2741  2762  2763  2776  2777  2792  2795*  2849*  2898#  2904  2912  2920
                         2925   2939*  2969*  2984
VP0   = 000000            318#   1028
VP1   = 000002            319#
VP2   = 000004            320#
VP3   = 000006            321#
VP4   = 000010            322#
VP5   = 000012            323#
VP6   = 000014            324#
VP7   = 000016            325#
```

```
WBIT  = 000100          486#
Z     = 000004          262#   613    639    718    793    867    948   1048   1129   1210   1308   1367   1390
                       1470  1556   1629   1710   1806   1863   1890   1971   2064   2138   2161   2249   2338
                       2499  2551   2577   2678   2751   2855   2887   2945
.     = 016414          497#   499#   501#   503#   505#   508#   541#   546#   550#   571    575    611    614
                        617    637    640    643    656    659    673    685    688    701    716    719    722
                        735    748    760    773    776    791    794    797    811    823    842    845    865
                        868    871    884    887    901    914    917    931    946    949    952    966    995
                       1010   1013   1026   1029   1046   1049   1052   1065   1081   1084   1087   1104   1107
                       1127   1130   1133   1146   1149   1163   1176   1179   1193   1208   1211   1214   1228
                       1256   1270   1273   1281   1291   1306   1309   1312   1325   1342   1345   1348   1365
                       1368   1371   1388   1391   1394   1407   1410   1424   1436   1439   1453   1468   1471
                       1474   1487   1511*  1512   1525   1528   1554   1557   1560   1575   1587   1604   1607
                       1627   1630   1633   1646   1649   1663   1676   1679   1693   1708   1711   1714   1728
                       1755   1769   1772   1789   1804   1807   1810   1824   1840   1843   1846   1861   1864
                       1867   1888   1891   1894   1907   1910   1924   1937   1940   1954   1969   1972   1975
                       1989   2016   2030   2033   2062   2065   2068   2082   2099   2102   2105   2136   2139
                       2142   2159   2162   2165   2179   2193   2208   2233   2247   2250   2253   2264   2280
                       2283   2302   2305   2319   2322   2336   2339   2342   2366   2369   2382   2399   2402
                       2405   2418   2421   2425   2442   2445   2464   2467   2480   2483   2497   2500   2503
                       2518   2521   2535   2549   2552   2555   2575   2578   2581   2597   2611   2626   2644
                       2660   2676   2679   2681   2694   2697   2726   2729   2749   2752   2755   2769   2783
                       2798   2816   2837   2853   2856   2859   2870   2885   2888   2891   2910   2913   2926
                       2929   2943   2946   2949   2973   2976   2990   3006   3009   3023
```

DCKTDA.P11 CROSS REFERENCE TABLE -- MACRO NAMES

```
COMMEN      1#
ENDCOM      1#
ESCAPE      1#
GETPRI      1#
GETSWR      1#
KKM       497#   555  1566
KKP       497#   602   664   782  1357  1415  1545
KKR       497#   648   692   707   765   817  1399  1444  1459  1517  1534  1581
KSM       497#   855   906   957   972   982  1019  1057  1617  1668  1719  1734  1744  1778  1816
KSMP      497#   892  1037  1654  1795
KSR       497#   833   876   922   937  1002  1070  1595  1638  1684  1699  1761  1829
KUM       497#  1117  1168  1219  1234  1244  1279  1317  1331  1878  1929  1980  1995  2005  2039
         2074
KUP       497#  1154  1297  1853  1915  2053
KUR       497#  1095  1138  1184  1199  1262  1899  1945  1960  2022  2088
LDKM1     497#   649   665   693   727   766   803   834   877   893   923   958   983  1003  1058
         1096  1139  1155  1185  1220  1245  1263  1318  1400  1416  1445  1479  1505  1518  1567
         1596  1639  1655  1685  1720  1745  1762  1817  1900  1916  1946  1981  2006  2023  2075
LDKO      497#   604   628   678   708   783   818   856   907   938  1038  1118  1169  1200  1298
         1358  1379  1429  1460  1546  1582  1618  1669  1700  1779  1796  1854  1879  1930  1961
         2040  2054
LDPDR     497#   578   580   581   582   583   584   585   586  1283  2118  2119  2120  2709  2710
         2711
LDSM1     497#  2171  2185  2200  2227  2272  2295  2359  2375  2433  2457  2511  2527  2588  2603
         2618  2632
LDSO      497#  2129  2150  2239  2259  2312  2328  2473  2489  2542  2566  2668
LDUM1     497#  2718  2761  2775  2790  2806  2903  2966  2983
LDUO      497#  2740  2824  2845  2865  2878  2919  2935
MULT        1#
NEWTST      1#
POP         1#
PUSH        1#
REPORT      1#
SETK      497#   522   557   825  1589
SETPRI      1#
SETS      497#
SETU      497#
SETUP       1#
SGF       497#   609   635   654   671   683   699   714   733   745   757   771   789   809   821
          840   863   882   899   912   929   944   964   977   992  1008  1031  1044  1063  1078
         1102  1125  1144  1161  1174  1191  1206  1226  1239  1253  1268  1287  1304  1323  1339
         1363  1386  1405  1422  1434  1451  1466  1485  1499  1501  1510  1523  1540  1552  1573
         1585  1602  1625  1644  1661  1674  1691  1706  1726  1739  1752  1767  1785  1802  1822
         1837  1859  1886  1905  1922  1935  1952  1967  1987  2000  2013  2028  2046  2060  2080
         2096  2134  2157  2177  2191  2206  2221  2231  2245  2262  2278  2300  2317  2334  2353
         2364  2380  2396  2416  2439  2462  2478  2495  2516  2533  2547  2573  2594  2609  2624
         2641  2656  2674  2692  2724  2747  2767  2781  2796  2815  2833  2851  2868  2883  2908
         2924  2941  2960  2971  2988  3004
SGN       497#   606   631   652   669   681   697   711   731   742   754   768   785   806   819
          836   859   880   897   910   927   941   962   974   987  1005  1022  1040  1061  1075
         1098  1121  1142  1159  1172  1189  1203  1224  1236  1248  1265  1284  1300  1321  1336
         1360  1382  1403  1420  1432  1449  1463  1483  1495  1507  1520  1537  1548  1570  1583
         1598  1621  1642  1659  1672  1689  1703  1724  1736  1747  1764  1782  1798  1820  1834
         1856  1882  1903  1920  1933  1950  1964  1985  1997  2008  2025  2043  2056  2078  2093
         2131  2153  2175  2189  2204  2217  2229  2241  2260  2274  2298  2315  2331  2350  2361
         2378  2393  2414  2435  2460  2476  2492  2513  2530  2544  2569  2592  2607  2622  2636
```

```
                2653    2670    2690    2720    2743    2765    2779    2794    2810    2828    2847    2866    2880    2906    2922
                2938    2957    2968    2986    3001
SKIP               1#
SLASH              1#
SR              497#    2184    2258    2432    2456    2488    2510
SSM             497#    2149    2199    2214    2226    2472    2526
SSMP            497#    2128    2170    2238
STARS              1#
SUM             497#    2311    2348    2374    2410    2565    2617    2631    2649
SUP             497#    2541    2587    2667
SUR             497#    2271    2294    2327    2358    2388    2602
SWRSU              1#
TYPBIN             1#
TYPDEC             1#
TYPNAM             1#
TYPNUM             1#
TYPOCS             1#
TYPOCT             1#
TYPTXT             1#
UUM             497#    2739    2789    2805    2918    2955    2982
UUP             497#    2760    2844    2877
UUR             497#    2717    2774    2823    2864    2902    2934    2965
$SESCA             1#
$SNEWT             1#
$SSKIP             1#
.EQUAT             1#
.HEADE             1#
.KT11              1#
.SETUP             1#
.SWRHI             1#
.$ACTI             1#
.$APTB             1#
.$APTH             1#
.$APTY             1#
.$ASTA             1#
.$CATC             1#
.$CMTA             1#
.$DB2D             1#
.$DB20             1#
.$DIV              1#
.$EOP              1#
.$ERRO             1#
.$ERRT             1#
.$MULT             1#
.$POWE             1#
.$RAND             1#
.$RDDE             1#
.$RDOC             1#
.$READ             1#
.$R2AZ             1#
.$SAVE             1#
.$SB2D             1#
.$SB20             1#
.$SCOP             1#
.$SIZE             1#
.$SUPR             1#
```

```
.STRAP      1#
.STYPB      1#
.STYPD      1#
.STYPE      1#
.STYPO      1#
.S40CA      1#
.1170       1#
```

```
ADD      514
ASR      529
BEQ      513   532   611   614   617   637   640   643   656   659   673   685   688   701   716
         719   722   735   748   760   773   776   791   794   797   811   823   842   845   865
         868   871   884   887   901   914   917   931   946   949   952   966   995  1010  1013
        1026  1029  1046  1049  1052  1065  1081  1084  1087  1104  1107  1127  1130  1133  1146
        1149  1163  1176  1179  1193  1208  1211  1214  1228  1256  1270  1273  1291  1306  1309
        1312  1325  1342  1345  1348  1365  1368  1371  1388  1391  1394  1407  1410  1424  1436
        1439  1453  1468  1471  1474  1487  1512  1525  1528  1554  1557  1560  1575  1587  1604
        1607  1627  1630  1633  1646  1649  1663  1676  1679  1693  1708  1711  1714  1728  1755
        1769  1772  1789  1804  1807  1810  1824  1840  1843  1846  1861  1864  1867  1988  1891
        1894  1907  1910  1924  1937  1940  1954  1969  1972  1975  1989  2016  2030  2033  2062
        2065  2068  2082  2099  2102  2105  2136  2139  2142  2159  2162  2165  2179  2193  2208
        2233  2247  2250  2253  2264  2280  2283  2302  2305  2319  2322  2336  2339  2342  2366
        2369  2382  2399  2402  2405  2418  2421  2425  2442  2445  2464  2467  2480  2483  2497
        2500  2503  2518  2521  2535  2549  2552  2555  2575  2578  2581  2597  2611  2626  2644
        2660  2676  2679  2681  2694  2697  2726  2729  2749  2752  2755  2769  2783  2798  2818
        2837  2853  2856  2859  2870  2885  2888  2891  2910  2913  2926  2929  2943  2946  2949
        2973  2976  2990  3006  3009  3019  3025
BIC      516
BIT      531
BPL     3023
BR      1281  1500
CLR      523   538   553   556   562   567   570   574   588   589   604   609   628   635   651
         654   661   668   671   678   683   696   699   703   708   714   730   733   746   758
         767   771   778   783   789   805   809   818   821   835   840   856   863   879   882
         889   896   899   907   912   926   929   933   938   944   961   964   978   984   986
         993  1004  1008  1015  1031  1038  1044  1060  1063  1072  1078  1097  1102  1118  1125
        1141  1144  1151  1158  1161  1169  1174  1188  1191  1195  1200  1206  1223  1226  1240
        1246  1254  1264  1268  1275  1288  1293  1298  1304  1320  1323  1333  1339  1358  1363
        1379  1386  1402  1405  1412  1419  1422  1429  1434  1448  1451  1455  1460  1466  1482
        1485  1494  1499  1501  1506  1510  1519  1523  1530  1540  1546  1552  1566  1569  1573
        1582  1585  1597  1602  1618  1625  1641  1644  1651  1658  1661  1669  1674  1688  1691
        1695  1700  1706  1723  1726  1740  1753  1763  1767  1774  1779  1786  1796  1802  1819
        1822  1831  1837  1854  1859  1879  1886  1902  1905  1912  1919  1922  1930  1935  1949
        1952  1956  1961  1967  1984  1987  2001  2014  2024  2028  2035  2040  2047  2054  2060
        2077  2080  2090  2096  2129  2134  2150  2157  2174  2177  2188  2191  2195  2203  2206
        2216  2222  2228  2231  2239  2245  2259  2262  2273  2278  2297  2300  2307  2312  2317
        2328  2334  2354  2360  2364  2371  2377  2380  2390  2396  2413  2416  2434  2440  2459
        2462  2469  2473  2478  2489  2495  2512  2516  2523  2529  2533  2542  2547  2566  2573
        2591  2594  2595  2606  2609  2613  2621  2624  2633  2642  2657  2663  2668  2674  2688
        2692  2719  2724  2740  2747  2764  2767  2778  2781  2785  2793  2796  2807  2816  2824
        2834  2840  2845  2851  2865  2868  2878  2883  2905  2908  2915  2919  2924  2935  2941
        2961  2967  2971  2978  2985  2988  2999  3004
CMP      610   636   658   684   715   747   759   790   864   886   913   945   994  1025  1028
        1045  1080  1086  1126  1148  1175  1207  1255  1290  1305  1341  1347  1364  1387  1409
        1435  1467  1553  1626  1648  1675  1707  1754  1788  1803  1839  1845  1860  1887  1909
        1936  1968  2015  2061  2098  2104  2135  2158  2246  2304  2318  2335  2398  2404  2417
        2424  2466  2479  2496  2548  2574  2643  2659  2675  2696  2748  2817  2836  2852  2884
        2912  2925  2942  3008  3018
CMPB     613   639   718   772   793   841   867   948  1009  1048  1103  1129  1210  1269  1308
        1367  1390  1470  1524  1556  1603  1629  1710  1768  1806  1863  1890  1971  2029  2064
        2138  2161  2249  2279  2338  2365  2441  2499  2517  2551  2577  2678  2725  2751  2855
        2887  2945  2972
EMT      491
HALT     490   497   744  1497  1539  2219  2831
```

```
INC      606  631  652  655  669  672  681  697  700  711  731  734  742  754  768
         775  785  806  810  819  836  844  859  880  883  897  900  910  927  930
         941  962  965  974  987 1005 1012 1022 1040 1061 1064 1075 1098 1106 1121
        1142 1145 1159 1162 1172 1189 1192 1203 1224 1227 1236 1248 1265 1272 1284
        1300 1321 1324 1336 1360 1382 1403 1406 1420 1423 1432 1449 1452 1463 1483
        1486 1495 1507 1511 1520 1527 1537 1548 1570 1574 1583 1598 1606 1621 1642
        1645 1659 1662 1672 1689 1692 1703 1724 1727 1736 1747 1764 1771 1782 1798
        1820 1823 1834 1856 1882 1903 1906 1920 1923 1933 1950 1953 1964 1985 1988
        1997 2008 2025 2032 2043 2056 2078 2081 2093 2131 2153 2175 2178 2189 2192
        2204 2207 2217 2229 2232 2241 2260 2274 2282 2298 2301 2315 2331 2350 2361
        2368 2378 2381 2393 2414 2420 2435 2444 2460 2463 2476 2492 2513 2520 2530
        2534 2544 2569 2592 2596 2607 2610 2622 2625 2636 2653 2670 2690 2720 2728
        2743 2765 2768 2779 2782 2794 2797 2810 2828 2847 2866 2880 2906 2909 2922
        2938 2957 2968 2975 2986 2989 3001 3017
JMP      506  515  539 3020 3030
JSR     3026
MFPD    1079 1340 1838 2097 2397 2423
MOV      521  522  524  525  526  527  537  557  559  560  561  563  568  569  572
         573  579  580  581  582  583  584  585  586  590  591  593  594  596  597
         603  605  608  629  630  634  648  649  650  664  665  666  667  679  680
         692  693  694  695  707  709  710  713  727  728  729  741  753  765  766
         770  782  784  788  803  804  817  825  833  834  839  855  857  858  862
         876  877  878  892  893  894  895  906  908  909  922  923  924  925  937
         939  940  943  957  958  959  960  972  973  982  983  985  997 1002 1003
        1007 1019 1020 1021 1032 1033 1037 1039 1043 1057 1058 1059 1070 1071 1073
        1074 1095 1096 1101 1117 1119 1120 1124 1138 1139 1140 1154 1155 1156 1157
        1168 1170 1171 1184 1185 1186 1187 1199 1201 1202 1205 1219 1220 1221 1222
        1234 1235 1244 1245 1247 1258 1262 1263 1267 1279 1280 1282 1283 1289 1297
        1299 1303 1317 1318 1319 1331 1332 1334 1335 1357 1359 1362 1380 1381 1385
        1399 1400 1401 1415 1416 1417 1418 1430 1431 1444 1445 1446 1447 1459 1461
        1462 1465 1479 1480 1481 1493 1505 1517 1518 1522 1534 1535 1536 1541 1545
        1547 1551 1567 1568 1581 1589 1595 1596 1601 1617 1619 1620 1624 1638 1639
        1640 1654 1655 1656 1657 1668 1670 1671 1684 1685 1686 1687 1699 1701 1702
        1705 1719 1720 1721 1722 1734 1735 1744 1745 1746 1757 1761 1762 1766 1778
        1780 1781 1787 1791 1795 1797 1801 1816 1817 1818 1829 1830 1832 1833 1853
        1855 1858 1878 1880 1881 1885 1899 1900 1901 1915 1916 1917 1918 1929 1931
        1932 1945 1946 1947 1948 1960 1962 1963 1966 1980 1981 1982 1983 1995 1996
        2005 2006 2007 2018 2022 2023 2027 2039 2041 2042 2048 2049 2053 2055 2059
        2074 2075 2076 2088 2089 2091 2092 2118 2119 2120 2121 2128 2130 2133 2149
        2151 2152 2156 2170 2171 2172 2173 2184 2185 2186 2187 2199 2200 2201 2202
        2214 2215 2226 2227 2238 2240 2244 2258 2271 2272 2277 2294 2295 2296 2311
        2313 2314 2327 2329 2330 2333 2348 2349 2358 2359 2363 2374 2375 2376 2388
        2389 2391 2392 2410 2411 2412 2432 2433 2438 2456 2457 2458 2472 2474 2475
        2488 2490 2491 2494 2510 2511 2515 2526 2527 2528 2541 2543 2546 2565 2567
        2568 2572 2587 2588 2589 2590 2602 2603 2604 2605 2617 2618 2619 2620 2631
        2632 2634 2635 2649 2650 2651 2652 2658 2662 2667 2669 2673 2686 2687 2689
        2709 2710 2711 2712 2717 2718 2723 2739 2741 2742 2746 2760 2761 2762 2763
        2774 2775 2776 2777 2789 2790 2791 2792 2805 2806 2808 2809 2823 2825 2826
        2827 2835 2839 2844 2846 2850 2864 2877 2879 2882 2902 2903 2904 2918 2920
        2921 2934 2936 2937 2940 2955 2956 2965 2966 2970 2982 2983 2984 2997 2998
        3000 3021 3024
MOVB     533
MTPD     528  530  607  633  653  670  682  698  712  732  743  755  769  787  808
         820  838  861  881  898  911  928  942  963  975  988 1006 1023 1042 1062
        1076 1077 1100 1123 1143 1160 1173 1190 1204 1225 1237 1249 1266 1285 1302
        1322 1337 1338 2132 2155 2176 2190 2205 2218 2230 2243 2261 2276 2299 2316
```

```
            2332    2351    2362    2379    2394    2395    2415    2691    2722    2745    2766    2780    2795    2811    2829
            2849    2867
MTPI        1361    1384    1404    1421    1433    1450    1464    1484    1496    1508    1521    1538    1550    1572    1584
            1600    1623    1643    1660    1673    1690    1704    1725    1737    1748    1765    1783    1800    1821    1835
            1836    1857    1884    1904    1921    1934    1951    1965    1986    1998    2009    2026    2044    2058    2079
            2094    2095    2437    2461    2477    2493    2514    2532    2545    2571    2593    2608    2623    2637    2654
            2672    2881    2907    2923    2939    2958    2969    2987    3002
NOP          552     566    3027    3028    3029
RTT          517     534
SCC          632     786     837     860    1041    1099    1122    1301    1383    1549    1599    1622    1799    1883    2057
            2154    2242    2275    2436    2570    2671    2721    2744    2848
SOB          571     575
SUB          511
TST          512     616     642     687     721     796     822     870     916     951    1051    1083    1132    1178    1213
            1311    1344    1370    1393    1438    1473    1559    1586    1632    1678    1713    1809    1842    1866    1893
            1939    1974    2067    2101    2141    2164    2252    2263    2321    2341    2401    2482    2502    2554    2580
            2693    2754    2858    2869    2890    2928    2948    3005
TSTB        3022
.ABS         231
.ENABL         1
.END        3032
.LIST             1     232     497
.MACR        497
.MACRO             1
.NLIST             :     233     497
.REM               1
.REPT        497
.TITLE       234
.WORD        500     502     504


ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

#,DCKTDA.SEQ/SOL/CRF/PAGNUM/NL:TOC=SYSMAC.CO,DCKTDA.P11
RUN-TIME:  29 38 5 SECONDS
RUN-TIME RATIO:  467/73=6.3
CORE USED:  33K  (65 PAGES)
```

Spooler runtime 11 Seconds. 48 KCS, 253 disk reads, 4 disk writes, 79 pages