KT11-C

MTPD/I

MD-11-DCKTD-A

EP-DCKTD-A-DL-A

NOV 1976

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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 SR0 IN LOCATION SSR0T, CLEARS SR0, JUMPS TO LOCATION 252 AND HALTS. TO DETERMINE WHICH TEST CAUSED THE ABORT EITHER EXAMINE THE KERNEL STACK OR EXAMINE R1 (R1 CONTAINS THE PC OF THE FIRST INSTRUCTION IN THE TEST).

7.0 RESTRICTIONS

7.1 STARTING RESTRICTION

NONE

7.2 OPERATIONAL RESTRICTION

NONE

8.0 MISCELLANEOUS

IF THE PROGRAM HALTS IN THE TRAP/INTERRUPT VECTOR AREA (0-1000), EXAMINE REGISTER 6 (THE K RNEL 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) KU14:
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 SUPER-VISORY 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.

```
                                .ABS
                                .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 OF PIRQ VECTOR
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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
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        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
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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
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        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
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                                        ;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
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        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)
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                                        ;TESTS KK0-KK15 TEST THE MTPD INSTRUCTION IN KERNEL MODE, PREV KERNEL MODE.
                                        ;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)
      001336                            T0A:
      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  10[illegible]677  135342          KK14:   MTPD    @VIRT           ;VIRT+4+(KSP)+
002436  00[illegible]037  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                      INC     @#SR0              ;ENABLE MEM MGMT
003202  106662  020000          KS6:        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+VPO+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 KU0-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-KKI6 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                  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                          KKI0:   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                  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                          KKI2:   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                     ;ERROR! INCORRECT RESULT
        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                 INC     @#SR0          ;ENABLE MEM MGMT
006110 006662 016600         KKI6:   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                      ;ERROR! INCORRECT STACK PTR AFTER TEST
        010174  104000                              SCOPE
```

```
                                  ;TESTS KUI0-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                    KUI0:   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                          SS5C:
     012174  005037  177572                  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                                  CL      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     (SSF)           ;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     @#SR0           ;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     @#SR0           ;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     @#SR0           ;ENABLE MEM MGMT
        013610  006637  040000          SSI4:   MTPI    @#VIRT          ;VIRT+(SSP)+
        013614  016700  164156                  MOV     PSW,R10         ;SAVE STATUS RESULT
        013620  005037  177572                  CLR     @#SR0           ;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     @#SR0           ;ENABLE MEM MGMT

        013702  006677  165076          SSI5:   MTPI    @TEMP           ;VIRT+4+(SSP)+
        013706  005037  177572                  CLR     @#SR0           ;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
```

L05


```
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     0C6110         1464#
KKI7     006204         1484#
KK0      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
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KSI10     007476         1737#
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                         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
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KS10      003344         975#
KS10A     003350         973     977#
KS11      003412         984*    988#
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KS12     003466       1006#
KS13     003554       1020     1023#    1032*
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KS7      003304        963#
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KUI10A   011042       1996     2000#
KUI11    011074       2009#
KUI11A   011102       2007     2013#
KUI12    011150       2026#
KUI13    011240       2041     2044#    2046*
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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#
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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*
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                         2517   2725   2972
NOP     = 000240         489#
NRA     = 100000         338#   1028
NRO     = 000000         474#
NR3     = 000003         477#
NR7     = 000007         481#
OST     = 004000         334#
PC      =%000007         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*
PIRG    = 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   [illegible] 2128   2149   2170   2184   2199   2214   2226   2238
                         2258   2432   2456   2472   [illegible] 2510   2526   2997
PSW     = 177776         289#   527*   529*   556*   603*   [illegible] 634    648*   661*   664*   692*   703*   707*
                         713    765*   770    778*   782*   768    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   1335   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*  [illegible] [illegible] [illegible] 1878*  [illegible] 1899*  1912*  1915*  1929*  1945*  1956*
                         1960*  1966   [illegible] 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*
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		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#												
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R0	=%000000	240#												
R1	=%000001	241#	521*	524										
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		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*	[illegible]	1401*	1404*	1409	1446*	1450*	1461*	1464*	1536*	1541	1597*	1600*
		1606*	[illegible]	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*	[illegible]	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	[illegible]	1634*	1917*	1918*	1921*	[illegible]	[illegible]	2041*	2048	2130*	2132*	2141
		2151*	2155*	2172*	2176*	[illegible]	[illegible]	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*	[illegible]	1362*	1367	1385*	1390	1551*	1556	1624*
		1629	1801*	1806	[illegible]	1863	[illegible]	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

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                          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
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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*
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SIPDR5= 172212            406#
SIPDR6= 172214            407#
SIPDR7= 172216            408#
SKO     014604           2691#
SLR   = 177774            290#   559*
SM    = 040000            269#  2128   2149   2170   2184   2199   2214   2226   2238   2258   2271   2294   2311
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                         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
SRO   = 177572            360#   537    538*   567*   606*   609*   631*   635*   652*   654*   669*   671*   681*
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                             683*   697*   699*   711*   714*   731*   733*   742*   746*   754*   758*   768*   771*
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                             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*
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                            1540*  1548*  1552*  1570*  157[illegible]*  1583*  1585*  1598*  1602*  1621*  1625*  1642*  1644*
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                            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#
```

G06


```
SUI7      014430         2651     2654*    2658*
SUI7A     014434         2652     2656*
SU0       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*
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UIPDR3= 177606          368#
UIPDR4= 177610          369#
UIPDR5= 177612          370#   586*
UIPDR6= 177614          371#
UIPDR7= 177616          372#
UN     = 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
UUI0     015572        2881#
UUI1     015662        2907#
UUI2     015744        2923#
UUI3     016022        2939#
UUI4     016106        2958#
UUI4A    016112        2956   2960#
UUI5     016142        2969#
UUI6     016234        2987#
UU0      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
```

J06


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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
```

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           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#
TYPRIN        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
$$ESCA        1#
$$NEWT        1#
$$SKIP        1#
.EQUAT        1#
.HEADE        1#
.KT11         1#
.SETUP        1#
.SWRHI        1#
.$ACT1        1#
.$APTB        1#
.$APTH        1#
.$APTY        1#
.$ASTA        1#
.$CATC        1#
.$CMTA        1#
.$DB2D        1#
.$DB2O        1#
.$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#
.$SB2O        1#
.$SCOP        1#
.$SIZE        1#
.$SUPR        1#
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.$TYPB       1#
.$TYPD       1#
.$TYPE       1#
.$TYPO       1#
.$40CA       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
         834   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
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CMPB     613    639    718    772    793    841    867    948   1009   1048   1103   1129   1210   1269   1308
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EMT      491
HALT     490    497    744   1497   1539   2219   2831
```

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JSR     3026
MFPD    1079  1340  1838  2097  2397  2423
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         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
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MOVB     533
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B07


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          2332  2351  2362  2379  2394  2395  2415  2691  2722  2745  2766  2780  2795  2811  2829
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MTPI      1361  1384  1404  1421  1433  1450  1464  1484  1496  1508  1521  1538  1550  1572  1584
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          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
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SOB        571   575
SUB        511
TST        512   616   642   687   721   796   822   870   916   951  1051  1083  1132  1178  1213
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TSTB      3022
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.ENABL       1
.END      3032
.LIST        1   232   497
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.MACRO       1
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.REM         1
.REPT      497
.TITLE     234
.WORD      500   502   504
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ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

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RUN-TIME: 29 38 5 SECONDS
RUN-TIME RATIO: 467/73=6.3
CORE USED:  33K  (65 PAGES)
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C07

Spooler runtime 11 Seconds, 90 KCS, 293 disk reads, 4 disk writes, 79 pages [illegible]

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[illegible] 34567890123456789012 **
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