

B01

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DCKTD-A-D
PRODUCT NAME: MTPD/I WITH MEMORY MANAGEMENT
DATE CREATED: 15 MARCH 1972
MAINTAINER: DIAGNOSTIC GROUP
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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 HIERARCHY 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 DEBLGGING 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 CONTINUOUSLY 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 SRO IN LOCATION SSROT, CLEARS SRO, JUMPS TO LOCATION 252 AND HALTS. TO DETERMINE WHICH TEST CAUSED THE ABORT EITHER EXAMINE THE KERNEL STACK OR EXAMINE R1 (R1 CONTAINS THE PC OF THE FIRST INSTRUCTION IN THE TEST).

7.0 RESTRICTIONS

7.1 STARTING RESTRICTION

NONE

7.2 OPERATIONAL RESTRICTION

NONE

8.0 MISCELLANEOUS

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

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

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

- 1) KUI4:
- 2) SSI7:

DENOTE:

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

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

8.2 STACK POINTER

THE STACK POINTERS ARE INITIALLY SET TO THE FOLLOWING VALUES

KERNEL = 1060
SUPERVISOR = 700
USER = 600

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

8.3 PASS COUNT

1000(8) PASSES ARE REQUIRED FOR COMPLETION OF THIS PROGRAM; AT WHICH TIME THE BELL WILL RING AT THE TTY. THE PASS COUNT MAY BE OBSERVED BY TURNING THE SWITCH TO THE DISPLAY POSITION. THE PASS COUNT SHOULD BE MONITORED IN THE EVENT THAT THE PROGRAM ENTERS AN UNDEFINED LOOP.

8.4 DEBUGGING TIPS

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

8.5 MEMORY MANAGEMENT MEMORY MAP

THE MAPPING OF THE MEMORY MANAGEMENT REGISTERS IS DONE AT THE BEGINNING OF THE PROGRAM BEFORE ANY TESTING IS STARTED. THIS MAP IS CHANGED TWICE, WHEN THE PROGRAM BEGINS TESTS IN SUPERVISORY MODE, AND AGAIN WHEN THE PROGRAM BEGINS TESTS AT USER MODE. THE USER SHOULD ACQUAINT HIMSELF WITH THE MEMORY MANAGEMENT MAP BEFORE USING THIS PROGRAM.

GO1
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H01

.ABS
.LIST ME
.NLIST SEQ,MD,MC
.TITLE PDP11/45 MEMORY MANAGEMENT TEST DCKTD-A
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;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 SRL BIT ASSIGNMENTS
000001                ENMM=1                    ;ENABLE MEMORY MANAGEMENT
000000                VPO=0                    ;VIRTUAL PAGE 0
000002                VP1=2                    ;
000004                VP2=4                    ;
000006                VP3=6                    ;
000010                VP4=10                   ;
000012                VP5=12                   ;
000014                VP6=14                   ;
000016                VP7=16                   ;
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

;SRI BIT ASSIGNMENTS
000010                INCI=10

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000020
000370
000360
000000
000400
001000
001400
002000
002400
003000
003400

INC2=20
DEC1=370
DEC2=360
DR0=000
DR1=400
DR2=1000
DR3=1400
DR4=2000
DR5=2400
DR6=3000
DR7=3400

;SR3 BIT ASSIGNMENTS

000001
000002
000004

UDE=1
SDE=2
KDE=4

;USER 'D' SPACE ENABLE
;SUPERVISOR 'D' SPACE ENABLE
;KERNEL 'D' SPACE ENABLE

;MEMORY MANAGEMENT REGISTER ADDRESS ASSIGNMENTS

177572
177574
177576
172516

SR0=177572
SR1=177574
SR2=177576
SR3=172516

;ADDRESS OF MEM MGMT REGISTER SR0
" " " " SR1
" " " " SR2
;ADDRESS OF MEM MGMT REGISTER SR3

177600
177602
177604
177606
177610
177612
177614
177616

UIPDR0=177600
UIPDR1=177602
UIPDR2=177604
UIPDR3=177606
UIPDR4=177610
UIPDR5=177612
UIPDR6=177614
UIPDR7=177616

;USER 'I' SPACE PDR'S

177620
177622
177624
177626
177630
177632
177634
177636

UDPDR0=177620
UDPDR1=177622
UDPDR2=177624
UDPDR3=177626
UDPDR4=177630
UDPDR5=177632
UDPDR6=177634
UDPDR7=177636

;USER 'D' SPACE PDR'S

177640
177642
177644
177646
177650
177652
177654
177656

UIPAR0=177640
UIPAR1=177642
UIPAR2=177644
UIPAR3=177646
UIPAR4=177650
UIPAR5=177652
UIPAR6=177654
UIPAR7=177656

;USER 'D' SPACE PAR'S

177660
177662
177664
177666
177670
177672

UDPAR0=177660
UDPAR1=177662
UDPAR2=177664
UDPAR3=177666
UDPAR4=177670
UDPAR5=177672

;USER 'I' SPACE PAR'S

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
    
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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      NRO=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
    
```

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

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

```

000004      000004      .=ERRVEC
000004      000400      .WORD SHLT      ;SET SUPER AND USER HALT TRAP
000030      000030      .=EMTVEC
000030      000432      .WORD SCOPEA    ;SET SCOPE (EMT) TRAP VECTOR
000250      000250      .=MMVEC
000250      000512      .WORD MMERR    ;SET MEM MGMT ERROR TRAP VECTOR
000200      000200      .=200
000200      000167      000664      JMP START      ;GO START TEST
000400      000400      .=400
    
```

MO1

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;SUPER/USER HALT TRAP SERVICE ROUTINE.
000400 162716 000002          SHLT:  SUB    #2,(KSP)          ;ADJUST PC
000404 005776 000000          TST     @2(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

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

```

```

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

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

;ROUTINE TO CLEAR MEM MGMT REGISTERS.
MMO:
;           NOP
;           CLR      SRO
;           MOV      #UIPDR0,R2
;           MOV      #40,R3
;           CLR      (R2)+
;           SOB      R3,-2
;           MOV      #SIPDR0,R2
;           MOV      #100,R3
;           CLR      (R2)+
;           SOB      R3,-2

;ROUTINE TO SET UP MEM MGMT REGISTERS FOR TESTS
MMK:
;           MOV      #167*400-400+UP+RW,@#KIPDR0 ;LOAD KIPDR0 RW,UP 167 BLOCKS
;           MOV      #11*400-400+UP+RW,@#KDPDR0 ;LOAD KDPDR0 RW,UP 11 BLOCKS
;           MOV      #1*400-400+UP+RW,@#KDPDR6 ;LOAD KDPDR6 RW,UP 1 BLOCKS
;           MOV      #200*400-400+UP+RW,@#KDPDR7 ;LOAD KDPDR7 RW,UP 200 BLOCKS
;           MOV      #1*400-400+UP+RW,@#SDPDR1 ;LOAD SDPDR1 RW,UP 1 BLOCKS
;           MOV      #1*400-400+UP+RW,@#SIPDR2 ;LOAD SIPDR2 RW,UP 1 BLOCKS
;           MOV      #1*400-400+UP+RW,@#UDPDR4 ;LOAD UDPDR4 RW,UP 1 BLOCKS
;           MOV      #1*400-400+UP+RW,@#UIPDR5 ;LOAD UIPDR5 RW,UP 1 BLOCKS

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

001322      012767      000172      176322
001330      012767      000173      176332
;           MOV      #172,UIPAR5 ;VA=120000-120077/PA=17200-17277 (USER I SPACE)
;           MOV      #173,UDPDR4 ;VA=100000-100077/PA=17300-17377 (USER D SPACE)

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; TESTS KKO-KK15 TEST THE MTPD INSTRUCTION IN KERNEL MODE, PREV KERNEL MODE.
; TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)

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TOA:
001236      012737 000340 177776      MOV      #PTY7, @PSW      ; KERNEL MODE!!!, PREV KERNEL MODE!!
001336      005016      CLR      (KSP)           ; PUT #0 ON KERNEL STACK
001344      012702 177777      MOV      #-1, R2        ; PRESET REGISTER
001346      005237 177572      INC      @SRO           ; ENABLE MEM MGMT
001352      106602      MTPD    R2              ; R2+(KSP)+
001356      013703 177776      MOV      @PSW, R3       ; SAVE STATUS RESULT
001360      005037 177572      CLR      @SRO           ; DISABLE MEM MGMT
001364      022706 001062      CMP      #KPTR+2, KSP   ; CHECK THAT STACK POPPED
001370      001401      BEQ     .+4             ;
001374      000000      HLT     ; ERROR! INCORRECT STACK PTR
001376      122703 000344      CMPB    #PTY7+Z, R3    ; CHECK STATUS RESULT
001400      001401      BEQ     .+4             ;
001404      000000      HLT     ; ERROR! INCORRECT STATUS RESULT
001406      005702      TST     R2              ; CHECK RESULT
001410      001401      BEQ     .+4             ;
001412      000000      HLT     ; ERROR! INCORRECT RESULT
001414      104000      SCOPE

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

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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      @SRO           ; ENABLE MEM MGMT
001440      000277      MTPD    (R2)           ; VIRT+(KSP)+
001442      106612      MOV      @PSW, R3       ; SAVE STATUS RESULT
001444      013703 177776      CLR      @SRO           ; DISABLE MEM MGMT
001450      005037 177572      CMP      #KPTR+2, KSP   ; CHECK THAT STACK POPPED
001454      022706 001062      BEQ     .+4             ;
001460      001401      HLT     ; ERROR! INCORRECT STACK PTR
001462      000000      CMPB    #Z+C, R3      ; CHECK STATUS RESULT
001464      122703 000005      BEQ     .+4             ;
001470      001401      HLT     ; ERROR! INCORRECT STATUS RESULT
001472      000000      TST     @PHYS          ; CHECK RESULT
001474      005737 016700      BEQ     .+4             ;
001500      001401      HLT     ; ERROR! INCORRECT RESULT
001502      000000      SCOPE
001504      104000

```

; DM=2

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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      @SRO           ; ENABLE MEM MGMT
001534      106622      MTPD    (R12)+        ; VIRT+(KSP)+

```



```

002010 012767 177777 014664      MOV      #-1,PHYS+2      ;PRESET DATA
002016 005237 177572              INC      @#SRO          ;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      @#SRO         ;DISABLE MEM MGMT
002036 022706 001062      CMP      #KPTR+2,KSP   ;CHECK THAT STACK POINTER POPPED
002042 001401              BEQ      .+4
002044 000000              HLT
002046 122700 004004      CMPB     #REG+Z,R10    ;ERROR! INCORRECT STACK PTR
002052 001401              BEQ      .+4          ;CHECK STATUS RESULT
002054 000000              HLT
002056 005737 016702      TST      @#PHYS+2     ;ERROR! INCORRECT STATUS RESULT
002062 001401              BEQ      .+4          ;CHECK RESULT
002064 000000              HLT
002066 104000              SCOPE                ;ERROR! INCORRECT RESULT

;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      @#SRO        ;ENABLE MEM MGMT
002116 106672 140002      KK7:    MTPD         @VIRT+2(R2) ;VIRT+(KSP)+
002122 005037 177572      CLR      @#SRO        ;DISABLE MEM MGMT
002126 005237 016700      INC      @#PHYS       ;CHECK RESULT
002132 001401              BEQ      .+4
002134 000000              HLT
002136 104000              SCOPE                ;ERROR! INCORRECT RESULT

;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      @#SRO        ;ENABLE MEM MGMT
002152 106617              KK10:   MTPD         (PC)      ;T11A+(KSP)+ SHOULD ABORT
002154 000000              KK10A:  HALT          ;ERROR! MTPD DID NOT ABORT
002156 005037 177572      KK10B:  CLR      @#SRO        ;DISABLE MEM MGMT
002162 022706 001056      CMP      #KPTR-2,KSP   ;CHECK STACK PTR
002166 001401              BEQ      .+4
002170 000000              HLT
002172 104000              SCOPE                ;ERROR! INCORRECT STACK PTR

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

;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      @#SRO         ;ENABLE MEM MGMT
002254 106637 140000          KK12:  MTPD    @#VIRT   ;VIRT+(KSP)+
002260 013700 177776          MOV      @#PSW,R10    ;SAVE STATUS RESULT
002264 005037 177572          CLR      @#SRO         ;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      @#SRO         ;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      @#SRO         ;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      @#SRO         ;ENABLE MEM MGMT
002432 106677 135342          KK14:  MTPD    @#VIRT   ;VIRT+4+(KSP)+
002436 005037 177572          CLR      @#SRO         ;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      @#SRO         ;ENABLE MEM MGMT
002470 106606          KK15:  MTPD    KSP     ;KSP+(KSP)+
002472 005037 177572          CLR      @#SRO         ;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 KSU-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      @#SRO ;ENABLE MEM MGMT
002532 000277      SCC
002534 106602      KSO: MTPD   R12 ;R12+(KSP)+
002536 013703 177776      MOV      @#PSW, R13 ;SAVE STATUS RESULT
002542 005037 177572      CLR      @#SRO ;DISABLE MEM MGMT
002546 122703 004011      CMPB    #REG+N+C, R13 ;CHECK STATUS RESULT
002552 001401      BEQ     .+4
002554 000000      HLT
002556 005202      INC      R12 ;ERROR INCORRECT STATUS RESULT
002560 001401      BEQ     .+4 ;CHECK RESULT
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      @#SRO ;ENABLE MEM MGMT
002614 000277      SCC
002616 106612      KSI: MTPD   (R2) ;VIRT+(KSP)+
002620 016703 175152      MOV      PSW, R3 ;SAVE STATUS RESULT
002624 005037 177572      CLR      @#SRO ;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      @#SRO ;ENABLE MEM MGMT
002710 106622      KS2: MTPD   (R12)+ ;VIRT+(KSP)+
002712 005037 177572      CLR      @#SRO ;DISABLE MEM MGMT
002716 005237 017100      INC      @#PHYS ;CHECK RESULT
002722 001401      BEQ     .+4

```


003176	005237	177572		INC	@#SRO	;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	@#SRO	;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	@#SRO	;ENABLE MEM MGMT
003304	106672	001006	KS7:	MTPD	@TEMP+2(R2)	;VIRT+(KSP)+
003310	005037	177572		CLR	@#SRO	;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	@#SRO	;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	@#SRO	;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	@#SRO	;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
						;ERROR! DID NOT ABORT
003416	000000		KS11A:	HLT		
003420						
003420	005037	177572		CLR	@#SRO	;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      @#SRO ;ENABLE MEM MGMT
003466 106637 020000      KS12: MTPD @#VIRT ;VIRT+(KSP)+
003472 016700 174300                      MOV      PSW,R10 ;SAVE STATUS RESULT
003476 005037 177572                      CLR      @#SRO ;DISABLE MEM MGMT
003502 122700 004010                      CMPB    #REG+N,R10 ;CHECK STATUS RESULT
003506 001401                      BEQ     .+4
003510 000000                      HLT
003512 005267 013362                      INC      PHYS ;ERROR! INCORRECT STATUS RESULT
003516 001401                      BEQ     .+4 ;CHECK RESULT
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      @#SRO ;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,@#SRO ;CHECK ABORT CONDITIONS
003576 001401                      BEQ     .+4
003600 000000                      HLT ;ERROR! ABORT CONDITONS ARE INCORRECT
003602 005037 177572                      CLR      @#SRO ;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+PTY7,@#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      @#SRO ;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      @#SRO ;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    #PTY7+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

```

K02

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```

003710 000000          HLT          ;ERROR! INCORRECT RESULT
003712 104000          SCOPE

;DM=7,PC
_03714 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      @#SRO ;ENABLE MEM MGMT
003744 106677 175034          MTPD    @TEMP ;VIRT+4+(KSP)+
003750 005037 177572          CLR      @#SRO ;DISABLE MEM MGMT
003754 005237 017104          INC      @#PHYS+4 ;CHECK RESULT
003760 001401          BEQ      .+4
003762 000000          HLT
003764 104000          SCOPE ;ERROR INCORRECT RESULT

;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      @#SRO ;ENABLE MEM MGMT
004020 106606          MTPD    SSP ;SSP+(KSP)+
004022 106636          MTPD    @#(KSP)+ ;VIRT+(KSP)+
004024 005037 177572          CLR      @#SRO ;DISABLE MEM MGMT
004030 106506          MFPD    SSP ;SET SUPER STACK PTR
004032 022716 020000          CMP      #VIRT,(KSP) ;CHECK THAT MTPD SSP SET SUPER STACK
004036 001401          BEQ      .+4 ;PTR
004040 000000          HLT ;ERROR! MTPD SSP FAILED
004042 005737 017100          TST     @#PHYS ;CHECK THAT MTPD @#(KSP)+ PUT THE COR-
004046 001401          BEQ      .+4 ;RECT DATA ONTO THE SUPER STACK
004050 000000          HLT ;ERROR! INCORRECT DATA AT PHYS
004052 022706 001056          CMP      #KPTR-2,KSP ;CHECK KERNEL STACK PTR
004056 001401          BEQ      .+4 ;4 PUSHES & 3 POPS
004060 000000          HLT ;ERROR! INCORRECT STACK PTR AFTER TEST
004062 104000          SCOPE
  
```

```
;TESTS KUU-KUI5 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      @#SRO          ;ENABLE MEM MGMT
004104 000277      SCC
004106 106602      MTPD    R12            ;R12+(KSP)+
004110 016703 173662      MOV      PSW,R13        ;SAVE STATUS RESULT
004114 005037 177572      CLR      @#SRO          ;DISABLE MEM MGMT
004120 122703 004011      CMPB    #REG+N+C,R13   ;CHECK STATUS RESULT
004124 001401      BEQ     .+4
004126 000000      HLT
004130 005202      INC      R12            ;ERROR INCORRECT STATUS RESULT
004132 001401      BEQ     .+4            ;CHECK RESULT
004134 000000      HLT
004136 104000      SCOPE                  ;ERROR! INCORRECT RESULT
```

```
;TEST THAT KERNEL 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

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      @#SRO          ;ENABLE MEM MGMT
004166 000277      SCC
004170 106612      MTPD    (R2)           ;VIRT+(KSP)+
004172 016703 173600      MOV      PSW,R3        ;SAVE STATUS RESULT
004176 005037 177572      CLR      @#SRO          ;DISABLE MEM MGMT
004202 022706 001062      CMP      #KPTR+2,KSP   ;CHECK THAT STACK POPPED
004206 001401      BEQ     .+4
004210 000000      HLT
004212 122703 000005      CMPB    #Z+C,R3        ;ERROR! INCORRECT STACK PTR
004216 001401      BEQ     .+4            ;CHECK STATUS RESULT
004220 000000      HLT
004222 005737 017300      TST     @#PHYS
004226 001401      BEQ     .+4            ;ERROR! INCORRECT STATUS RESULT
004230 000000      HLT                    ;CHECK RESULT
004232 104000      SCOPE                  ;ERROR! INCORRECT RESULT
```

```
;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      @#SRO          ;ENABLE MEM MGMT
004262 106622      MTPD    (R12)+        ;VIRT+(KSP)+
004264 005037 177572      CLR      @#SRO          ;DISABLE MEM MGMT
004270 005237 017300      INC      @#PHYS        ;CHECK RESULT
004274 001401      BEQ     .+4
```

MO2

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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	01277	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	@#SRO	;ENABLE MEM MGMT
004350	106632			MTPD	@(R2)+	;VIRT+4+(KSP)+
004352	005037	177572		CLR	@#SRO	;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	@#SRO	;ENABLE MEM MGMT
004416	106644			MTPD	-(R4)	;VIRT+(KSP)+
004420	005037	177572		CLR	@#SRO	;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	@#SRO	;ENABLE MEM MGMT
004502	106652			MTPD	@-(R12)	;VIRT+(KSP)+
004504	005037	177572		CLR	@#SRO	;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

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004550 005237 177572          INC      @#SRO      ;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      @#SRO     ;DISABLE MEM MGMT
004570 022706 001062          CMP      #KPTR+2,KSP ;CHECK THAT STACK POINTER POPPED
004574 001401          BEQ      .+4
004576 000000          HLT
004600 122700 004004          CMPB    #REG+Z,R10 ;ERROR! INCORRECT STACK PTR
004604 001401          BEQ      .+4      ;CHECK STATUS RESULT
004606 000000          HLT
004610 005737 017302          TST     @#PHYS+2   ;ERROR! INCORRECT STATUS RESULT
004614 001401          BEQ      .+4      ;CHECK RESULT
004616 000000          HLT
004620 104000          SCOPE           ;ERROR! INCORRECT RESULT

004622 012737 030000 177776      ;DM=7      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      @#SRO     ;ENABLE MEM MGMT
004656 106672 001006      KU7:  MTPD     @TEMP+2(R2) ;VIRT+(KSP)+
004662 005037 177572          CLR      @#SRO     ;DISABLE MEM MGMT
004666 005237 017300          INC      @#PHYS    ;CHECK RESULT
004672 001401          BEQ      .+4
004674 000000          HLT
004676 104000          SCOPE           ;ERROR! INCORRECT RESULT

;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      @#SRO     ;ENABLE MEM MGMT
004716 106607          KU10: MTPD     PC      ;PC+(KSP)+
004720 000000          HLT              ;ERROR! MTPD DID NOT LOAD PC
004722 005037 177572          CLR      @#SRO     ;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      @#SRO     ;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
                                ;ERROR! DID NOT ABORT
004764 000000          HLT
004766 005037 177572          CLR      @#SRO     ;DISABLE MEM MGMT
004766 005037 177572          CMP      #KPTR-2,KSP ;CHECK STACK PTR
004772 022706 001056          BEQ      .+4
004776 001401          HLT
005000 000000          HLT
005002 012737 000512 000250      MOV      #MMERR,@#MMVEC ;ERROR! STACK PTR NOT PUSHED TWICE ON ERROR

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005010 104000          SCOPE

;DM=3,PC
005012 012737 034000 177776 MOV    #PUM+REG,2#PSW ;KERNEL MODE!!!,PREV USER MODE!!
005020 012716 177777          MOV    #-1,(KSP) ;PUT #-1 ON KERNEL STACK
005024 005037 017300          CLR    2#PHYS
005030 005237 177572          INC    2#SRO ;ENABLE MEM MGMT
005034 106637 100000          MTPD  2#VIRT ;VIRT+(KSP)+
005040 016700 172732          MOV    PSW,R10 ;SAVE STATUS RESULT
005044 005037 177572          CLR    2#SRO ;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,2#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,2#UDPDR0 ;LOAD UDPDR0 RW,UP 53 BLOCKS
005122 005237 177572          INC    2#SRO ;ENABLE MEM MGMT
005126 106647          MTPD  -(PC) ;-(PC)+(KSP)+
005130 000000          HLT                    ;ERROR! MTPD FAILED
005132          KU13A:
005132 005037 177572          CLR    2#SRO ;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    2#UDPDR0
005156 104000          SCOPE

;DM=6,PC
005160 012737 030340 177776 MOV    #PUM+PRTY7,2#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    2#SRO ;ENABLE MEM MGMT
005202 000277          SCC
005204 106667 072574          MTPD  VIRT+4 ;VIRT+4+(KSP)+
005210 016703 172562          MOV    PSW,R3 ;SAVE STATUS RESULT
005214 005037 177572          CLR    2#SRO ;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   2#PHYS+4 ;CHECK RESULT
005244 001401          BEQ    .+4
005246 000000          HLT                    ;ERROR! INCORRECT RESULT
005250 104000          SCOPE

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;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 @SRO ;ENABLE MEM MGMT
005302 106677 173476 KU15: MTPD @TEMP ;VIRT+4+(KSP)+
005306 005037 177572 CLR @SRO ;DISABLE MEM MGMT
005312 005237 017304 INC @PHYS+4 ;CHECK RESULT
005316 001401 BEQ .+4
005320 000000 HLT
005322 104000 SCOPE ;ERROR INCORRECT RESULT

;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 @SRO ;ENABLE MEM MGMT
005356 106606 KU16: MTPD USP ;USP+(KSP)+
005360 106676 MTPD @(KSP) ;VIRT+(KSP)+
005364 005037 177572 CLR @SRO ;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

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;TESTS KK10-KK16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV KERNEL MODE
016600          VIRT=16600          ;KERNEL VIRTUAL 'I' ADDRESS FOR THESE TESTS
016600          PHYS=16600         ;CORRESPONDING KERNEL PHYSICAL 'I' ADDRESS

;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
005424 012737 000340 177776      MOV    #PRTY7,2#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    2#SRO           ;ENABLE MEM MGMT
005444 006602                    MTPI   R2                ;R2+(KSP)+
005446 016703 172324              MOV    PSW,R3         ;SAVE STATUS RESULT
005452 005037 177572              CLR    2#SRO         ;DISABLE MEM MGMT
005456 022706 001062              CMP    #KPTR+2,KSP   ;CHECK THAT STACK POPPED
005462 001401                    BEQ    .+4
005464 000000                    HLT
005466 122703 000344              CMPB  #PRTY7+Z,R3    ;ERROR! INCORRECT STACK PTR
005472 001401                    BEQ    .+4            ;CHECK STATUS RESULT
005474 000000                    HLT
005476 005702                    TST   R2              ;ERROR! INCORRECT STATUS RESULT
005500 001401                    BEQ    .+4            ;CHECK RESULT
005502 000000                    HLT
005504 104000                    SCOPE                ;ERROR! INCORRECT RESULT

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

;DM=2
005574 012737 004000 177776      MOV    #REG,2#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    2#PHYS        ;PRESET DATA
005616 005237 177572              INC    2#SRO         ;ENABLE MEM MGMT
005622 006622                    MTPI   (R12)+        ;VIRT+(KSP)+
005624 005037 177572              CLR    2#SRO         ;DISABLE MEM MGMT
005630 005237 016600              INC    2#PHYS        ;CHECK RESULT

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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	@#SRO	;ENABLE MEM MGMT
005712	006632			MTPI	@(R2)+	;VIRT+4+(KSP)+
005714	005037	177572		CLR	@#SRO	;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	@#SRO	;ENABLE MEM MGMT
005752	006644			MTPI	-(R4)	;VIRT+(KSP)+
005754	005037	177572		CLR	@#SRO	;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	@#SRO	;ENABLE MEM MGMT
006036	006652			MTPI	@-(R12)	;VIRT+(KSP)+
006040	005037	177572		CLR	@#SRO	;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

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006104 005237 177572          INC      @#SRO      ;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      @#SRO      ;DISABLE MEM MGMT
006124 022706 001062          CMP      @#KPTR+2,KSP ;CHECK THAT STACK POINTER POPPED
006130 001401          BEQ      .+4
006132 000000          HLT
006134 122700 004004          CMPB    @#REG+2,R10 ;ERROR! INCORRECT STACK PTR
006140 001401          BEQ      .+4      ;CHECK STATUS RESULT
006142 000000          HLT
006144 005737 016602          TST     @#PHYS+2   ;ERROR! INCORRECT STATUS RESULT
006150 001401          BEQ      .+4      ;CHECK RESULT
006152 000000          HLT
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     @#SRO      ;ENABLE MEM MGMT
006204 006672 001006      KKI7:  MTPI      @TEMP+2(R2) ;VIRT+(KSP)+
006210 005037 177572          CLR     @#SRO      ;DISABLE MEM MGMT
006214 005237 016600          INC     @#PHYS   ;CHECK RESULT
006220 001401          BEQ      .+4
006222 000000          HLT
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     @#SRO      ;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     @#SRO      ;DISABLE MEM MGMT
006252 000765          BR      KKI10B    ;LOOP TEST IF ERROR
006254 005037 177572          CLR     @#SRO      ;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     @#SRO      ;ENABLE MEM MGMT
006276 006627      KKI11: MTPI      (PC)+  ;(PC)++(KSP)+
006300 000000          KKI11A: 0
006302 005037 177572          CLR     @#SRO      ;DISABLE MEM MGMT
006306 005267 177766          INC     .-6      ;CHECK THAT DATA POPPED TO
006312 001401          BEQ     .+4      ;CORRECT ADDRESS
006314 000000          HLT
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

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006332 005037 016600          CLR      @#PHYS
006336 005237 177572          INC      @#SRO      ;ENABLE MEM MGMT
005342 006637 016600          KKI12:  MTPI     @#VIRT ;VIRT+(KSP)+
006346 016700 171424          MOV      PSW,R10   ;SAVE STATUS RESULT
006352 005037 177572          CLR      @#SRO      ;DISABLE MEM MGMT
006356 122700 004010          CMPB    @REG+N,R10 ;CHECK STATUS RESULT
006362 001401          BEQ     .+4
006364 000000          HLT
006366 005267 010206          INC      PHYS      ;ERROR! INCORRECT STATUS RESULT
006372 001401          BEQ     .+4      ;CHECK RESULT
006374 000000          HLT
006376 005067 171374          CLR      PSW      ;ERROR! INCORRECT RESULT
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      @#SRO      ;ENABLE MEM MGMT
006426 006647          KKI13:  MTPI     -(PC) ;-(PC)+(KSP)+
006430 000000          HLT      ;ERROR! MTPI - (PC) FAILED
006432 005037 177572          CLR      @#SRO      ;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      @#SRO      ;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      @#SRO      ;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      @#SRO      ;ENABLE MEM MGMT

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

```

```

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

006606 012737 004000 177776 ;CHECK THAT MTP1 CAN SET STACK PTR
006614 005016      MOV      #REG,@#PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
006616 005237 177572      CLR      (KSP)          ;PUT #0 ON KERNEL STACK
006622 006606      INC      @#SRO          ;ENABLE MEM MGMT
006624 005037 177572      MTP1     KSP           ;KSP+(KSP)+
006630 005706      CLR      @#SRO          ;DISABLE MEM MGMT
006632 001401      TST      KSP           ;CHECK STACK PTR
006634 000000      BEQ      .+4
006636 012706 001060      HLT
006642 104000      MOV      #KPTR,KSP      ;ERROR!
                                ;SET KERNEL STACK PTR
                                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      @#SRO           ;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      @#SRO           ;DISABLE MEM MGMT
006700 122703 004011      CMPB    #REG+N+C, R13    ;CHECK STATUS RESULT
006704 001401      BEQ     .+4
006706 000000      HLT
006710 005202      INC      R12             ;ERROR INCORRECT STATUS RESULT
006712 001401      BEQ     .+4             ;CHECK RESULT
00714 000000      HLT
00716 104000      SCOPE                   ;ERROR! INCORRECT RESULT

```

;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      @#SRO           ;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      @#SRO           ;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      @#SRO           ;ENABLE MEM MGMT
007042 006622      KSI2:  MTPI      (R12)+  ;VIRT+(KSP)+
007044 005037 177572      CLR      @#SRO           ;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
007070 005067 170702          CLR      PSW            ;ERROR! AUTO-INCREMENT FAILED
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      @#SRO           ;ENABLE MEM MGMT
007130 006632          KSI3:  MTPI            @-(R2)+ ;VIRT+4+(KSP)+
007132 005037 177572          CLR      @#SRO           ;DISABLE MEM MGMT
007136 005237 017004          INC      @#PHYS+4       ;CHECK RESULT
007142 001401          BEQ      .+4
007144 000000          HLT
007146 104000          SCOPE                ;ERROR! INCORRECT RESULT

;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      @#SRO           ;ENABLE MEM MGMT
007176 006644          KSI4:  MTPI            -(R4)   ;VIRT+(KSP)+
007200 005037 177572          CLR      @#SRO           ;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
007224 104000          SCOPE                ;ERROR! INCORRECT RESULT

;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      @#SRO           ;ENABLE MEM MGMT
007262 006652          KSI5:  MTPI            @-(R12) ;VIRT+(KSP)+
007264 005037 177572          CLR      @#SRO           ;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      @#SRO           ;ENABLE MEM MGMT
    
```

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

                                ;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      @#SRO        ;ENABLE MEM MGMT
007436 006672 001006      KSI7:  MTPi  @TEMP+2(R2) ;VIRT+(KSP)+
007442 005037 177572      CLR      @#SRO        ;DISABLE MEM MGMT
007446 005237 017000      INC      @#PHYS       ;CHECK RESULT
007452 001401      BEQ      .+4
007454 000000      HLT
007456 104000      SCOPE                ;ERROR! INCORRECT RESULT

                                ;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      @#SRO        ;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      @#SRO        ;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      @#SRO        ;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
                                ;ERROR! DID NOT ABORT
007540 000000      KSI11A: HLT
007542      CLR      @#SRO        ;DISABLE MEM MGMT
007542 005037 177572      CMP      #KPTR-2,KSP ;CHECK THAT STACK PTR WAS PUSHED TWICE
007546 022706 001056      BEQ      .+4
007552 001401      HLT
007554 000000      HLT
007556 012737 000512 000250      MOV      #MMERR,@#MMVEC ;ERROR! INCORRECT STACK PTR
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 @#SRO ;ENABLE MEM MGMT
007610 006637 040000 KSI12: MTPI @#VIRT ;VIRT+(KSP)+
007614 016700 170156 MOV PSW,R10 ;SAVE STATUS RESULT
007620 005037 177572 CLR @#SRO ;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 @#SRO ;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 @#SRO ;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 @#SRO ;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 @#SRO ;DISABLE MEM MGMT
007774 022706 001062 CMPB #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

```

M03

PDP11/45 MEMORY MANAGEMENT TEST DCKTD-A MACY11 27(732) 01-OCT-76 13:30 PAGE 39
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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	@#SRO	; ENABLE MEM MGMT
010056	006677	170722		KSI15:	MTP1	@TEMP	; VIRT+4+(KSP)+
010062	005037	177572			CLR	@#SRO	; 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 MTP1 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	@#SRO	; ENABLE MEM MGMT
010132	006606			KSI16:	MTP1	SSP	; SSP+(KSP)+
010134	006636				MTP1	@(KSP)+	; VIRT+(KSP)+
010136	005037	177572			CLR	@#SRO	; DISABLE MEM MGMT
010142	106506				MFPD	SSP	; GET STACK PTR
010144	022716	040000			CMP	#VIRT, (KSP)	; CHECK THAT MTP1 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      @#SRO                ;ENABLE MEM MGMT
010216 006602                    MTPI     R2                    ;R2+(KSP)+
010220 016703 167552            MOV      PSW,R3              ;SAVE STATUS RESULT
010224 005037 177572            CLR      @#SRO                ;DISABLE MEM MGMT
010230 022706 001062            CMP      #KPTR+2,KSP         ;CHECK THAT STACK POPPED
010234 001401                    BEQ      .+4
010236 000000                    HLT
010240 122703 000344            CMPB    #PRTY7+Z,R3          ;ERROR! INCORRECT STACK PTR
010244 001401                    BEQ      .+4                  ;CHECK STATUS RESULT
010246 000000                    HLT
010250 005702                    TST     R2                    ;ERROR! INCORRECT STATUS RESULT
010252 001401                    BEQ      .+4                  ;CHECK RESULT
010254 000000                    HLT
010256 104000                    SCOPE                          ;ERROR! INCORRECT RESULT

```

;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      @#SRO                ;ENABLE MEM MGMT
010306 000277                    SCC
010310 006612                    MTPI     (R2)                 ;VIRT+(KSP)+
010312 016703 167460            MOV      PSW,R3              ;SAVE STATUS RESULT
010316 005037 177572            CLR      @#SRO                ;DISABLE MEM MGMT
010322 022706 001062            CMP      #KPTR+2,KSP         ;CHECK THAT STACK POPPED
010326 001401                    BEQ      .+4
010330 000000                    HLT
010332 122703 000005            CMPB    #Z+C,R3              ;ERROR! INCORRECT STACK PTR
010336 001401                    BEQ      .+4                  ;CHECK STATUS RESULT
010340 000000                    HLT
010342 005737 017200            TST     @#PHYS                ;ERROR! INCORRECT STATUS RESULT
010346 001401                    BEQ      .+4                  ;CHECK RESULT
010350 000000                    HLT
010352 104000                    SCOPE                          ;ERROR! INCORRECT RESULT

```

;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      @#SRO                ;ENABLE MEM MGMT
010402 006622                    MTPI     (R12)+              ;VIRT+(KSP)+
010404 005037 177572            CLR      @#SRO                ;DISABLE MEM MGMT

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```

010410 005237 017200          INC      @#PHYS      ;CHECK RESULT
010414 001401                BEQ      .+4
010416 000000                HLT
010420 022702 120002          CMP      @#VIRT+2,R12 ;ERROR! INCORRECT RESULT
010424 001401                BEQ      .+4          ;CHECK AUTO-INCREMENT
010426 000000                HLT          ;ERROR! AUTO-INCREMENT FAILED
010430 005067 167342          CLR      PSW
010434 104000                SCOPE

010436 012737 030340 177776 ;DM=3  MOV      @#PUM+PTY7,@#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      @#SRO        ;ENABLE MEM MGMT
010470 006632                MTPR    @#(R2)+      ;VIRT+4+(KSP)+
010472 005037 177572          CLR      @#SRO        ;DISABLE MEM MGMT
010476 005237 017204          INC      @#PHYS+4     ;CHECK RESULT
010502 001401                BEQ      .+4
010504 000000                HLT
010506 104000                SCOPE          ;ERROR! INCORRECT RESULT

010510 012737 030000 177776 ;DM=4  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      @#SRO        ;ENABLE MEM MGMT
010536 006644                MTPR    -(R4)        ;VIRT+(KSP)+
010540 005037 177572          CLR      @#SRO        ;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

010566 012737 034000 177776 ;DM=5  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      @#SRO        ;ENABLE MEM MGMT
010622 006652                MTPR    @#-(R12)     ;VIRT+(KSP)+
010624 005037 177572          CLR      @#SRO        ;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

010646 012737 034000 177776 ;DM=6  MOV      @#PUM+REG,@#PSW ;KERNEL MODE!!!,PREV USER MODE!!
010654 005016                CLR      (KSP)        ;PUT #0 ON KERNEL STACK

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010656 012702 000002          MOV      #2,R12          ;LOAD INDEX REGISTER
010662 012767 177777 006312  MOV      #-1,PHYS+2     ;PRESET DATA
010670 005237 177572          INC      @#SRO          ;ENABLE MEM MGMT
010674 006662 120000          MTPI    VIRT(R12)      ;VIRT+2+(KSP)+
010700 016700 167072          MOV      PSW,R10       ;SAVE STATUS RESULT
010704 005037 177572          CLR      @#SRO          ;DISABLE MEM MGMT
010710 022706 001062          CMP     @KPTR+2,KSP    ;CHECK THAT STACK POINTER POPPED
010714 001401          BEQ     .+4
010716 000000          HLT
010720 122700 004004          CMPB   @REG+2,R10     ;ERROR! INCORRECT STACK PTR
010724 001401          BEQ     .+4           ;CHECK STATUS RESULT
010726 000000          HLT
010730 005737 017202          TST    @#PHYS+2       ;ERROR! INCORRECT STATUS RESULT
010734 001401          BEQ     .+4           ;CHECK RESULT
010736 000000          HLT
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      @#SRO          ;ENABLE MEM MGMT
010776 006672 001006  KUI7:  MTPI    @TEMP+2(R2) ;VIRT+(KSP)+
011002 005037 177572          CLR      @#SRO          ;DISABLE MEM MGMT
011006 005237 017200          INC      @#PHYS        ;CHECK RESULT
011012 001401          BEQ     .+4
011014 000000          HLT
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      @#SRO          ;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      @#SRO          ;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      @#SRO          ;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
;ERROR! DID NOT ABORT
011100 000000          KUI11A: HLT
011102          CLR      @#SRO          ;DISABLE MEM MGMT
011102 005037 177572          CMP     @KPTR-2,KSP    ;CHECK THAT STACK PTR WAS PUSHED TWICE
011106 022706 001056          BEQ     .+4
011112 001401          HLT
011114 000000          ;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      @#SRO ;ENABLE MEM MGMT
011150 006637 120000      KUI12: MTPI @#VIRT ;VIRT+(KSP)+
011154 016700 166616                      MOV      PSW,R10 ;SAVE STATUS RESULT
011160 005037 177572                      CLR      @#SRO ;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      @#SRO ;ENABLE MEM MGMT
011240 006647      KUI13: MTPI -(PC) ;-(PC)+(KSP)+
011242 000000                      HLT     ;ERROR! FAILED TO ABORT
011244      KUI13A:
011244 005037 177572                      CLR      @#SRO ;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+PTY7,@#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      @#SRO ;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      @#SRO ;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    #PTY7+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

```

E04

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	@#SRO	;ENABLE MEM MGMT
011406	006677	167372		KUI15:	MTP1	@#TEMP	;VIRT+4+(KSP)+
011412	005037	177572			CLR	@#SRO	;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 MTP1 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 THE STACK
011444	012746	120000			MOV	#VIRT,-(KSP)	
011450	012737	177777	017200		MOV	#-1,@#PHYS	;PRESET STACK DATA
011456	005237	177572			INC	@#SRO	;ENABLE MEM MGMT
011462	006606			KUI16:	MTP1	USP	;USP+(KSP)+
011464	006636				MTP1	@(KSP)+	;VIRT+(KSP)+
011466	005037	177572			CLR	@#SRO	;DISABLE MEM MGMT
011472	106506				MFPD	USP	;GET USER STACK PTR
011474	022716	120000			CMP	#VIRT,(KSP)	;CHECK THAT MTP1 USP SET USER STACK PTR
011500	001401				BEQ	+.4	
011502	000000				HLT		;ERROR! MTP1 USP FAILED
011504	005737	017200			TST	@#PHYS	;CHECK THAT MTP1 @(KSP)+ PUT THE
011510	001401				BEQ	+.4	;CORRECT DATA ONTO THE USER STACK
011512	000000				HLT		;ERROR! MTP1 @(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 S50-S510 TEST THE MTPD INSTRUCTION IN SUPERVISORY MODE, PREV SUPERVISORY MODE.
;VIRT=20000 ;SUPERVISOR VIRTUAL 'D' ADDRESS FOR THESE TESTS
;PHYS=17100 ;CORRESPONDING SUPER PHYSICAL 'D' ADDRESS
    
```

```

020000
017100
    
```

```

;TEST THAT MTPD CAN LOAD A GENERAL REGISTER (R2)
;SUPER MODE!!!, PREV SUPER MODE!!
    
```

```

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                      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
011620 122703 000344      CMPB     #PRTY7+Z, R3 ;ERROR! INCORRECT STACK PTR
011624 001401                      BEQ     .+4 ;CHECK STATUS RESULT
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                      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
011732 104000                SCOPE          ;ERROR! INCORRECT RESULT

;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      @#SRO             ;ENABLE MEM MGMT
011770 106632                MTPD     @#SRO             ;VIRT+4+(SSP)+
011772 005037 177572          CLR      @#SRO             ;DISABLE MEM MGMT
011776 005237 017104          INC      @#PHYS+4          ;CHECK RESULT
012002 001401                BEQ      .+4
012004 000000                HLT
012006 104000                SCOPE          ;ERROR! INCORRECT RESULT

;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      @#SRO             ;ENABLE MEM MGMT
012044 106652                MTPD     @#SRO             ;VIRT+(SSP)+
012046 005037 177572          CLR      @#SRO             ;DISABLE MEM MGMT
012052 005237 017100          INC      @#PHYS           ;CHECK RESULT
012056 001401                BEQ      .+4
012060 000000                HLT
012062 005067 165710          CLR      PSW
012066 104000                SCOPE          ;ERROR! INCORRECT RESULT

;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      @#SRO             ;ENABLE MEM MGMT
012124 106672 020002          MTPD     @#SRO             ;VIRT+(SSP)+
012130 005037 177572          CLR      @#SRO             ;DISABLE MEM MGMT
012134 005237 017100          INC      @#PHYS           ;CHECK RESULT
012140 001401                BEQ      .+4
012142 000000                HLT
012144 104000                SCOPE          ;ERROR! INCORRECT RESULT

;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      #SSSC,(SSP)       ;PUT 'NEW' PC ON STACK
012160 005037 012172          CLR      @#SSSA            ;PUT HALT FOLLOWING MTPD
012164 005237 177572          INC      @#SRO             ;ENABLE MEM MGMT
012170 106607                MTPD     PC
012172 000000                SSSA:   HALT              ;PC+(SSP)+
;ERROR! MTPD DID NOT POP WORD OFFD
    
```

```

012174                                     ;STACK & INTO PC
012174 005037 177572                      S55C: CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
012224 106637 020000                      S56: MTPD @#VIRT ;VIRT+(SSP)+
012230 005037 177572                     CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
012270 000277                             SCC
012272 106667 005506                      S57: MTPD VIRT+4 ;VIRT+4+(SSP)+
012276 016703 165474                     MOV PSW,R3 ;SAVE STATUS RESULT
012302 005037 177572                     CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
012354 106606                             S510: MTPD SSP ;SSP+(SSP)+
012356 005037 177572                     CLR @#SRO ;DISABLE MEM MGMT
012362 005706                             TST SSP ;CHECK STACK PTR
012364 001401                             BEQ .+4
012366 000000                             HLT ;ERROR!
012370 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 @#SRO ;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 @#SRO ;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 @#SRO ;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 @#SRO ;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 @#SRO ;ENABLE MEM MGMT
012754 106637 100000 SU5: MTPD @#VIRT ;VIRT+(SSP)+
012760 016700 165012 MOV PSW,R10 ;SAVE STATUS RESULT
012764 005037 177572 CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
013046 106677 165732 SU6: MTPD @#TEMP ;VIRT+4+(SSP)+
013052 005037 177572 CLR @#SRO ;DISABLE MEM MGMT

```

K04

```

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

;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      @#SRO              ;ENABLE MEM MGMT
013122 106606                MTPD    USP                ;USP+(SSP)+
013124 106636                MTPD    @ (SSP)+          ;VIRT+(SSP)+
013126 005037 177572          CLR      @#SRO              ;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      @#SRO              ;ENABLE MEM MGMT
013214 106636                MTPD    @ (SSP)+          ;MOVES -1 TO VIRT
013216 005037 177572          CLR      @#SRO              ;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

```



```

013470 104000 SCOPE
;DM=6
013472 012737 054000 177776 ;DM=6 MOV #SM+PSM+REG,@#PSW ;SUPER MODE!!!,PREV SUPER MODE!!
013500 005016 CLR (SSP) ;PUT #0 ON SUPER STACK
013502 012702 000002 MOV #2,R12 ;LOAD INDEX REGISTER
013506 012767 177777 003266 MOV #-1,PHYS+2 ;PRESET DATA
013514 005237 177572 INC @#SRO ;ENABLE MEM MGMT
013520 006662 040000 SSI3: MTPI VIRT(R12) ;VIRT+2+(SSP)+
013524 016700 164246 MOV PSW,R10 ;SAVE STATUS RESULT
013530 005037 177572 CLR @#SRO ;DISABLE MEM MGMT
013534 022706 000702 CMP #SPTR+2,SSP ;CHECK THAT STACK POINTER POPPED
013540 001401 BEQ .+4
013542 000000 HLT ;ERROR! INCORRECT STACK PTR
013544 122700 004004 CMPB #REG+Z,R10 ;CHECK STATUS RESULT
013550 001401 BEQ .+4
013552 000000 HLT ;ERROR! INCORRECT STATUS RESULT
013554 005737 017002 TST @#PHYS+2 ;CHECK RESULT
013560 001401 BEQ .+4
013562 000000 HLT ;ERROR! INCORRECT RESULT
013564 104000 SCOPE

```

```

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

```

```

013652 012737 050000 177776 MOV #SM+PSM,@#PSW ;SUPER MODE!!!,PREV SUPER MODE!!
013660 012716 177777 MOV #-1,(SSP) ;PUT #-1 ON SUPER STACK
013664 012737 040004 001004 MOV #VIRT+4,@#TEMP ;LOAD ADDRESS
013672 005037 017004 CLR @#PHYS+4 ;PRESET DATA
013675 005237 177572 INC @#SRO ;ENABLE MEM MGMT
013702 006677 165076 SSI5: MTPI @#TEMP ;VIRT+4+(SSP)+
013706 005037 177572 CLR @#SRO ;DISABLE MEM MGMT
013712 005237 017004 INC @#PHYS+4 ;CHECK RESULT
013716 001401 BEQ .+4
013720 000000 HLT ;ERROR INCORRECT RESULT
013722 104000 SCOPE

```

```

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

```



```

014102 012737 070340 177776 ;DM=3  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    @#SRO                 ;ENABLE MEM MGMT
014134 006632  SUI2:  MTP1  @-(R2)+            ;VIRT+4+(SSP)+
014136 005037 177572  CLR    @#SRO                 ;DISABLE MEM MGMT
014142 005037 177572  CLR    @#SRO                 ;DISABLE MEM MGMT
014146 005237 017204  INC    @#PHYS+4              ;CHECK RESULT
014152 001401  BEQ    .+4
014154 000000  HLT
014156 104000  SCOPE                        ;ERROR! INCORRECT RESULT

014160 012737 074000 177776 ;DM=5  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    @#SRO                 ;ENABLE MEM MGMT
014214 006652  SUI3:  MTP1  @-(R12)          ;VIRT+(SSP)+
014216 005037 177572  CLR    @#SRO                 ;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

014240 012737 070000 177776 ;DM=7  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    @#SRO                 ;ENABLE MEM MGMT
014274 006672  SUI4:  MTP1  @TEMP+2(R2)      ;VIRT+(SSP)+
014300 005037 177572  CLR    @#SRO                 ;DISABLE MEM MGMT
014304 005237 017200  INC    @#PHYS                ;CHECK RESULT
014310 001401  BEQ    .+4
014312 000000  HLT                          ;ERROR! INCORRECT RESULT
014314 104000  SCOPE

014316 012737 070000 177776 ;DM=2,PC 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 MTP1
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    @#SRO                 ;ENABLE MEM MGMT
014354 006627  SUI6:  MTP1  (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:	CLR	@#SRO	;DISABLE MEM MGMT
014362	005037	177572			CMP	@SPTR-2,SSP	;CHECK STACK PTR
014366	022706	000676			BEQ	.+4	
014372	001401				HLT		;ERROR! STACK PTR NOT PUSHED TWICE ON ERROR
014374	000000				SCOPE		
014376	104000						
014400	012737	070000	177776	;DM=4,PC	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	@#SRO	;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	@#SRO	;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+PRTY7,2#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 2#SR0 ;ENABLE MEM MGMT
014512 000277 SCC
014514 006667 103264 SUI10: MTP1 VIRT+4 ;VIRT+4+(SSP)+
014520 016703 163252 MOV PSW,R3 ;SAVE STATUS RESULT
014524 005037 177572 CLR 2#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 CMPEB #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,2#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 #-1,2#16776 ;PRESET CORRESPONDING PHYS ADDRESS
014600 005237 177572 INC 2#SR0 ;ENABLE MEM MGMT
014604 106676 000000 SKO: MTPD 2(SSP) ;LOAD KERNEL SPACE FROM SUPER STACK
014610 005037 177572 CLR 2#SR0 ;DISABLE MEM MGMT
014614 005737 016776 TST 2#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
014634 104000 SCOPE

```

E05

```

;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, @#UIPDRO ;LOAD UIPDRO RW, DWN 146 BLOCKS
014644 012737 004006 177620      MOV      #11*400-400+UP+RW, @#UDPDRO   ;LOAD UOPDRO RW, UP 11 BLOCKS
014652 012737 077406 177636      MOV      #200*400-400+UP+RW, @#UOPDR7 ;LOAD UOPDR7 RW, UP 200 BLOCKS
014660 012767 007600 163010      MOV      #7600, UOPAR7
  
```

```

;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 002237 177572              INC      @#SRO                          ;ENABLE MEM MGMT
014706 000277              SCC
UU0:  MTPD      R12                          ;R12+(USP)+
014710 106602              MOV      PSW, R13                      ;SAVE STATUS RESULT
014712 016703 163060              CLR      @#SRO                          ;DISABLE MEM MGMT
014716 005037 177572              CMPB    #REG+N+C, R13                  ;CHECK STATUS RESULT
014722 122703 004011              BEQ     .+4
014726 001401              HLT
014730 007000              INC      R12                          ;ERROR INCORRECT STATUS RESULT
014732 002237 177572              BEQ     .+4                          ;CHECK RESULT
014734 001401              HLT
014736 000000              HLT
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      @#SRO                          ;ENABLE MEM MGMT
014770 000277              SCC
UU1:  MTPD      (R2)                          ;VIRT+(USP)+
014772 106612              MOV      PSW, R3                      ;SAVE STATUS RESULT
014774 016703 162776              CLR      @#SRO                          ;DISABLE MEM MGMT
015000 005037 177572              CMP     #UPTR+2, USP                ;CHECK THAT STACK POPPED
015004 022706 000602              BEQ     .+4
015010 001401              HLT
015012 000000              INC      R12                          ;ERROR! INCORRECT STACK PTR
015014 122703 000005              CMPB    #Z+C, R3                      ;CHECK STATUS RESULT
015020 001401              HLT
015022 000000              HLT
015024 005737 017300              TST     @#PHYS
015030 001401              BEQ     .+4
015032 000000              HLT
  
```

```

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 @#SRO ;ENABLE MEM MGMT
015072 106632 UU3: MTPD @-(R2)+ ;VIRT+4+(USP)+
015074 005037 177572 CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
015146 106652 UU4: MTPD @-(R12) ;VIRT+(USP)+
015150 005037 177572 CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
015226 106672 UU5: MTPD @VIRT+2(R2) ;VIRT+(USP)+
015232 005037 177572 CLR @#SRO ;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 UUA
015266 012737 015314 000250 MOV #UUA,@#MMVEC
015274 016737 162476 000252 MOV PSW,@#MMVEC+2
015302 005237 177572 INC @#SRO ;ENABLE MEM MGMT
015306 106627 UU6: MTPD @-(C)+ ;(PC)++(USP)+
015310 000000 UU6A: 0 ;ERROR! DID NOT ABORT & PC DID NOT AUTO-

```

```

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

;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      @#SRO         ; ENABLE MEM MGMT
015366 106647                                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      @#SRO         ; 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      @#SRO         ; 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      @#SRO         ; 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      @#SRO         ; ENABLE MEM MGMT
015534 106606                                MTPD     USP          ; USP+(USP)+
015536 005037 177572                        CLR      @#SRO         ; DISABLE MEM MGMT

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H05

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015542 005706
015544 001401
015546 000000
015550 104000

TST
BEQ
HLT
SCOPE

USP
. +4

;CHECK STACK PTR
;ERROR!


```

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 @#SRO ;ENABLE MEM MGMT
016022 006662 120000 UII3: MTPI @#VIRT ;VIRT+2*(USP)+
016026 016700 161744 MOV PSW,R10 ;SAVE STATUS RESULT
016032 005037 177572 CLR @#SRO ;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 #UII4A,(USP) ;PUT NEW PC ON STACK AS DATA
016102 005237 177572 INC @#SRO ;ENABLE MEM MGMT
016106 006607 UII4: MTPI PC ;PC+(USP)+
016110 000000 HLT ;ERROR! MTPI DID NOT LOAD PC
016112 UII4A:
016112 005037 177572 CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT
016142 006637 120000 UII5: MTPI @#VIRT ;VIRT+(USP)+
016146 016700 161624 MOV PSW,R10 ;SAVE STATUS RESULT
016152 005037 177572 CLR @#SRO ;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 @#SRO ;ENABLE MEM MGMT

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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#		
KKIO	=	005444	1361#		
KKI1	=	005530	1384#		
KKI10	=	006242	1496#		
KKI10A	=	006244	1494#	1497#	
KKI10B	=	006226	1493#	1500	
KKI11	=	006276	1508#		
KKI11A	=	006300	1506#	1509#	
KKI12	=	006342	1521#		
KKI13	=	006426	1536	1538#	1541*
KKI14	=	006470	1550#		
KKI15	=	006564	1572#		
KKI16	=	006622	1584#		
KKI2	=	005622	1404#		
KKI3	=	005712	1421#		
KKI4	=	005752	1433#		
KKI5	=	006036	1450#		
KKI6	=	006110	1464#		
KKI7	=	006204	1484#		
KKO	=	001356	607#		
KK1	=	001442	633#		
KK10	=	002152	743#		
KK10A	=	002154	744#		

MNO	= 001144	566#												
N	= 000010	263#	772	841	1009	1103	1269	1524	1603	1768	2029	2279	2365	2441
		2517	2725	2972										
NOP	= 000240	489#												
NRA	= 100000	338#	1028											
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	1829	2128	2149	2170	2184	2199	2214	2226	2238
		2258	2422	2456	2472	2473	2510	2526	2997					
PSM	= 177776	289#	527*	529*	556*	603*	603	634	648*	661*	664*	692*	703*	707*
		713	765*	770	778*	782*	788	817*	833*	839	855*	862	876*	889*
		892*	906*	922*	933*	937*	943	957*	972*	982*	1002*	1007	1015*	1019*
		1037*	1043	1057*	1070*	1095*	1101	1117*	1124	1138*	1151*	1154*	1168*	1184*
		1195*	1199*	1205	1219*	1234*	1244*	1262*	1267	1275*	1279*	1297*	1303	1317*
		1331*	1357*	1362	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*	1829*	1853*	1858	1878*	1875	1899*	1912*	1915*	1929*	1945*	1956*
		1960*	1966	1980*	1995*	2005*	2022*	2027	2035*	2039*	2053*	2059	2074*	2088*
		2128*	2133	2149*	2156	2170*	2184*	2195*	2199*	2214*	2226*	2238*	2244	2258*
		2271*	2277	2294*	2307*	2311*	2327*	2333	2348*	2358*	2363	2371*	2374*	2388*
		2410*	2432*	2438	2456*	2469*	2472*	2488*	2494	2510*	2515	2523*	2526*	2541*

		2546	2565*	2572	2587*	2602*	2613*	2617*	2631*	2635	2649*	2667*	2673	2686*
		2717*	2723	2739*	2746	2760*	2774*	2785*	2789*	2805*	2809	2823*	2827	2844*
		2850	2864*	2877*	2882	2902*	2915*	2918*	2934*	2940	2955*	2965*	2970	2978*
		2982*	2997*											
PUM	= 030000	273#	527	1095	1117	1138	1154	1168	1184	1199	1219	1234	1244	1262
		1279	1297	1317	1331	1853	1878	1899	1915	1929	1945	1960	1980	1995
		2005	2022	2039	2053	2074	2088	2271	2294	2311	2327	2348	2358	2374
		2388	2410	2541	2505	2587	2602	2617	2631	2649	2667	2717	2739	2760
		2774	2789	2805	2823	2844	2864	2877	2902	2918	2934	2955	2965	2982
R00	= 000002	476#												
R00T	= 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#												
RWTM	= 000005	479#												
RO	= %000000	240#												
R1	= %000001	241#	521*	524										
R10	= %000000	247#	713*	718	770*	772	943*	948	1007*	1009	1205*	1210	1267*	1269
		1465*	1470	1522*	1524	1705*	1710	1766*	1768	1966*	1971	2027*	2029	2333*
		2338	2363*	2365	2494*	2499	2515*	2517	2940*	2945	2970*	2972		
R11	= %000001	248#												
R12	= %000002	249#	650*	653*	658	694*	698*	709*	712*	835*	838*	844*	878*	881*
		886	924*	928*	939*	942*	1097*	1100*	1106*	1140*	1143*	1148	1186*	1190*
		1201*	1274*	1401*	1404*	1409	1446*	1450*	1461*	1464*	1536*	1541	1597*	1600*
		1606*	1643*	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*	2456	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*	833*	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	1890*	1834*	1917*	1918*	1921*	1922*	1955*	2041*	2048	2130*	2132*	2141
		2151*	2155*	2172*	2176*	2201*	2205*	2543*	2545*	2554	2567*	2571*	2589*	2590*
		2593*	2619*	2623*	2651*	2658	2741*	2745*	2762*	2766*	2791*	2795*	2879*	2881*
		2890	3024*											
R3	= %000003	243#	569*	571*	573*	575*	608*	613	634*	639	788*	793	862*	867
		1043*	1048	1124*	1129	1303*	1379	1362*	1367	1385*	1390	1551*	1556	1624*
		1629	1801*	1806	1878*	1863	1875*	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

683*	697*	699*	711*	714*	731*	733*	742*	746*	754*	758*	768*	771*	
785*	789*	806*	809*	819*	821*	836*	840*	859*	863*	880*	882*	897*	
899*	910*	912*	927*	929*	941*	944*	962*	964*	974*	978*	987*	993*	
1005*	1008*	1022*	1028	1031*	1040*	1044*	1061*	1063*	1075*	1078*	1098*	1102*	
1121*	1125*	1142*	1144*	1159*	1161*	1172*	1174*	1189*	1191*	1203*	1206*	1224*	
1226*	1236*	1240*	1248*	1254*	1265*	1268*	1284*	1288*	1300*	1304*	1321*	1323*	
1336*	1339*	1360*	1363*	1382*	1386*	1403*	1405*	1420*	1422*	1432*	1434*	1449*	
1451*	1463*	1466*	1483*	1485*	1495*	1499*	1501*	1507*	1510*	1520*	1523*	1537*	
1540*	1548*	1552*	1570*	1574*	1583*	1585*	1598*	1602*	1621*	1625*	1642*	1644*	
1659*	1661*	1672*	1674*	1684*	1691*	1703*	1706*	1724*	1726*	1736*	1740*	1747*	
1753*	1764*	1767*	1782*	1786*	1798*	1802*	1820*	1822*	1834*	1837*	1856*	1859*	
1862*	1886*	1903*	1905*	1920*	1922*	1933*	1935*	1950*	1952*	1964*	1967*	1985*	
1987*	1997*	2001*	2008*	2014*	2025*	2028*	2043*	2047*	2056*	2060*	2078*	2080*	
2093*	2096*	2131*	2134*	2153*	2157*	2175*	2177*	2189*	2191*	2204*	2206*	2217*	
2222*	2229*	2231*	2241*	2245*	2260*	2262*	2274*	2278*	2298*	2300*	2315*	2317*	
2331*	2334*	2350*	2354*	2361*	2364*	2378*	2380*	2393*	2396*	2414*	2416*	2435*	
2440*	2460*	2462*	2476*	2478*	2492*	2495*	2513*	2516*	2530*	2533*	2544*	2547*	
2569*	2573*	2592*	2594*	2595*	2607*	2609*	2622*	2624*	2636*	2642*	2653*	2657*	
2670*	2674*	2690*	2692*	2720*	2724*	2743*	2747*	2765*	2767*	2779*	2781*	2794*	
2796*	2810*	2816*	2828*	2834*	2847*	2851*	2866*	2868*	2880*	2883*	2906*	2908*	
2922*	2924*	2938*	2941*	2957*	2961*	2968*	2971*	2986*	2988*	3001*	3004*		
	537*	544*											
	361#												
	362#												
	363#	563*											
	2439#												
	2461#												
	2477#												
	2493#												
	2514#												
	2532#												
	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	
	2132#												
	2155#												
	2261#												
	2176#												
	2190#												
	2205#												
	2218#												
	2216#	2219#											
	2215	2221#											
	2230#												
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