

PDP11/45

MFPD/I W/MEMORY MANAGEMENT
MD-11-DCKTE-B

EP DCKTE B DL A

OCT 1976

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FICHE 1 OF 1

Made in U.S.A.

Table with multiple columns and rows of data, likely representing memory management information. The text is very faint and difficult to read, but appears to be organized in a grid-like structure.

Small table or data block located in the bottom right corner of the page.

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.BLANK 1
.TAB STOPS 8
.INDENT -8
1.0 ABSTRACT
.BLANK 1
PROGRAM DCKTE TESTS THE MFPD AND MFPI INSTRUCTIONS WITH MEMORY
MANAGEMENT ENABLED. (SEE PROG DCKBO FOR TESTS OF THESE INSTRUCTIONS
WITHOUT MEM MGMT. THESE INSTRUCTIONS ARE EXECUTED IN ALL
COMBINATIONS OF CURRENT MODES AND EQUAL OR LOWER HEIRARCHY PREVIOUS
MODES.
.BLANK 1
.INDENT -8
2.0 REQUIREMENTS
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.INDENT -8
2.1 EQUIPMENT
.BLANK 1
PDP-11/45 WITH KT11-C (MEM. MGMT) OPTION INSTALLED
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.INDENT -8
2.2 STORAGE
.BLANK 1
PROGRAM STORAGE - THE ROUTINE USES MEMORY 0-17777
.BLANK 1
.INDENT -8
3.0 LOADING AND STARTING PROCEDURE
.BLANK 1
LOAD PROGRAM INTO MEMORY USING ABS LOADER
.BREAK
LOAD ADDRESS 200
.BREAK
PRESS START.
.BREAK
THE PROGRAM WILL LOOP AND RING BELL ON COMPLETION.
.BREAK
PASS COUNT MAY BE MONITORED IN THE DISPLAY REGISTER.
.BLANK 1
.INDENT -8
4.0 SWITCH SETTINGS
.BLANK 1
.LEFT MARGIN 16
SW8 = 1 OR UP .... LOAD PDP11/45 MICRO BREAK REGISTER
.BREAK
SW7-SW0..... VALUE TO BE LOADED
.LEFT MARGIN 8
.INDENT -8
5.0 SUBROUTINE ABSTRACTS
.BLANK 1
.INDENT -8
5.1 HLT
.BLANK 1
THE HLT (HALT) INSTRUCTION IS EXECUTED WHEN AN ERROR IS DETECTED.
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.
PRESSING CONTINUE RESTARTS THE TEST.

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DO1

POP11/45 MEMORY MANAGEMENT TEST DCKTE-B MACY11 27(732) 09-SEP-76 16:53 PAGE 3
DCKTEB.P11

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.BREAK
NOTE: THE SUPERVISORY/USER STACK POINTERS ARE NOT AFFECTED.
FURTHER TESTING SHOULD NOT BE CONTINUED (BY PRESSING CONTINUE).
THE PROGRAM SHOULD BE RESTARTED EITHER AT THE PREVIOUS SCOPE
OR AT 200.
.PAGE

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5.2 SCOPE
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THE SCOPE (ENT) SERVICE ROUTINE STORES IN R1 THE PC OF THE LAST
TEST SUCCESSFULLY EXECUTED AND MAY BE USED AS AN AID IN
DEBUGGING IF THE PROGRAM 'BOMBS' BECAUSE OF A HARDWARE FAILURE.
A BRANCH INSTRUCTION MAY BE INSERTED AT THE SCOPE LOCATION TO
THE PREVIOUS SCOPE (ENT) 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.
.BLANK 1
.INDENT -8
6.0 ERRORS
.BLANK 1
THE TEST HALTS WHEN AN ERROR IS DETECTED AND DISPLAYS THE PC+2
OF THE HLT (HALT) INSTRUCTION IN THE ADDRESS LIGHTS.
.BLANK 1
.INDENT -8
6.1 ERROR RECOVERY
.BLANK 1
PRESS CONTINUE OR RESTART AT 200 OR PREVIOUS SCOPE.
.BLANK 1
.INDENT -8
6.2 ERROR LOOPING
.BLANK 1
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.
.BLANK 1
.INDENT -8
6.3 MEMORY MANAGEMENT ABORT ERRORS
.BLANK 1
IF AN ABORT OCCURS (EXCEPT WHEN A TEST EXPECTS AN ABORT) THE
PROGRAM WILL TRAP. THE TRAP SERVICE ROUTINE SAVES THE CONTENTS
OF SR0 IN LOCATION SSR0T, CLEARS SR0, JUMPS TO LOCATION 252 AND
HALTS. TO DETERMINE WHICH TEST CAUSED THE ABORT EITHER EXAMINE
THE KERNEL STACK OR EXAMINE R1 (R1 CONTAINS THE PC OF THE FIRST
INSTRUCTION IN THE TEST), OR EXAMINE SR2 WHICH CONTAINS THE
ADDRESS OF THE INSTRUCTION THAT CAUSED THE ABORT.
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.BLANK 1
.INDENT -8
7.0 RESTRICTIONS
.BLANK 1
.INDENT -8
7.1 STARTING RESTRICTION
.BLANK 1
NONE
.BLANK 1
.INDENT -8
7.2 OPERATIONAL RESTRICTION
.BLANK 1
NONE
.BLANK 1
.INDENT -8
8.0 MISCELLANEOUS
.BLANK 1
IF THE PROGRAM HALTS IN THE TRAP/INTERRUPT VECTOR AREA (0-100),
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 TO DETERMINE THE PC OF THE LAST TEST SUCCESSFULLY
COMPLETED.
.BLANK 1
8.1 NOTE THAT THE PROGRAM TAGS EACH MFPD/I INSTRUCTION UNDER TEST.
THE TAG DENOTES CURRENT SPACE, 'PREVIOUS' SPACE AND WHETHER
MFPD/I. FOR EXAMPLE:
.BLANK 1
.LEFT MARGIN 12
.INDENT -4
1) KU14:
.INDENT -4
2) SSI7:
.BLANK 1
.INDENT -4
DENOTE:
.BLANK 1
.INDENT -4
1) 'CURRENT' KERNEL MODE, 'PREVIOUS' USER MODE, MFPD
.INDENT -4
2) 'CURRENT' SUPERVISOR MODE, 'PREVIOUS' SUPERVISOR MODE, MFPI
.BLANK 1
.LEFT MARGIN 8
NOTE ALSO THAT MEM. MGMT IS ENABLED ONLY WHEN THE MFPD/I
INSTRUCTION BEING TESTED IS EXECUTED AND IS OFF AT ALL OTHER
TIMES.
.BREAK
FINAL DATA IS STORED IN 'PREVIOUS' 'I' OR 'D' ADDRESS SPACE.
.PAGE
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.BLANK 1
.INDENT -8
0.2 STACK POINTER
.BLANK 1
THE STACK POINTERS ARE INITIALLY SET TO THE FOLLOWING VALUES
.LEFT MARGIN 16
KERNEL = 1060
.BREAK
SUPERVISOR = 700
.BREAK
USER = F600
.BLANK 1
.LEFT MARGIN 8
AND ARE RESET TO THESE VALUES AT THE START OF EACH SUBTEST (BY SCOPE).
.BLANK 1
.LEFT MARGIN 8
.INDENT -8
0.3 PASS COUNT
.BLANK 1
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.
.BLANK 1
.INDENT -8
0.4 DEBUGGING TIPS
.BLANK 1
WHEN THE FAILING SUBTEST HAS BEEN ISOLATED, REPLACE THE FIRST
WORD OF THE MFPD/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.
IN THE BREAD BOARD.
.BLANK 1
.INDENT -8
0.5 MEMORY MANAGEMENT MEMORY MAP
.BLANK 1
THE MAPPING OF THE MEM MGMT REGISTERS IS DONE AT THE
BEGINNING OF THE PROGRAM BEFORE ANY TESTING IS STARTED. THIS
MAP IS CHANGED TWICE, WHEN THE PROGRAM BEGINS TESTS IN SUPER-
VISORY MODE, AND AGAIN WHEN THE PROGRAM BEGINS TESTS AT USER
MODE. THE USER SHOULD ACQUAINT HIMSELF WITH THE MEM. MGMT
MAP BEFORE USING THIS PROGRAM.
.PAGE
.FIGURE 15
.PAGE
.BREAK
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X
.NLIST SEQ
.LIST ME
.ABS
.TITLE PDP11/45 MEMORY MANAGEMENT TEST DCKTE-B
;COPYRIGHT 1972. DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS.

;MEMORY MANAGEMENT TEST-DKTCEA. THIS TEST TESTS THE MFPI AND MFPD INST-
;RUCTIONS IN ALL COMBINATIONS OF CURRENT MODE AND EQUAL OR LOWER HEIRARCHY
;PREVIOUS MODES 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
000002 V=2
000004 Z=4
000010 N=10
000020 T=20
000340 PRTY7=340 ;'T' BIT
000200 PRTY4=200 ;PRIORITY LEVEL 7
004000 REG=4000 ;PRIORITY LEVEL 4
000000 KM=000000 ;SELECTS R10-R15
040000 SM=040000 ;KERNEL MODE
140000 UM=140000 ;SUPERVISORY MODE
000000 PKM=000000 ;USER MODE
010000 PSM=010000 ;PREVIOUS KERNEL MODE
030000 PUM=030000 ;PREVIOUS SUPERVISORY MODE
004000 REG=004000 ;PREVIOUS USER MODE
;SELECT R10-R15

;VECTOR ADDRESSES

000004 ERRVEC=4 ;ADDRESS OF ERROR VECTOR
000014 TBITVEC=14 ;ADDRESS OF 'T' BIT TRAP VECTOR
000020 IOTVEC=20 ;ADDRESS OF IOT 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
000250 MMVEC=250 ;ADDRESS OF MEM MGMT ERROR TRAP


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;REGISTER ADDRESSES
177776 PSH=177776 ;ADDRESS OF STATUS REGISTER
177774 SLR=177774 ;ADDRESS OF STACK LIMIT REGISTER
177772 PIRG=177772 ;ADDRESS OF PROGRAM INTERRUPT REQUEST
177770 LBREAK=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 SMR=177570 ;ADDRESS OF CONSOL SWITCH REGISTER
177570 LIGHTS=177570 ;ADDRESS OF CONSOL LIGHT REGISTER

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

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

;MEMORY MANAGEMENT REGISTER SR0 BIT ASSIGNMENTS
000001 ENMM=1 ;ENABLE MEMORY MANAGEMENT
000000 VPO=0 ;VIRTUAL PAGE 0
000002 VP1=2 ;ETC
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 LPG=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

;SEGMENT DESCRIPTOR REGISTER (PDR) BIT ASSSIGNMENTS
000010 ED=10 ;EXPANSION DIRECTION BIT IN PDR
000000 UP=0 ;EXPAND UP

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000010
000200
000100

DWN=10
ABIT=200
WBIT=100

:EXPAND DOWN
: 'A' BIT IN PDR
: 'W' BIT IN PDR

;SR1 BIT ASSIGNMENTS

000010
000020
000370
000360
000000
000400
001000
001400
002000
002400
003000
003400

INC1=10
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

;SEGMENTATION REGISTER ADDRESS ASSIGNMENTS

177572
177574
177576
172516

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

:ADDRESS OF SEGMENTATION REGISTER SRO
: " " " " SR1
: " " " " SR2
: " " " " 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

177620
177622
177624
177626
177630
177632
177634
177636

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

177640
177642
177644
177646
177650
177652
177654
177656

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

177660
177662
177664
177666
177670
177672
177674
177676

UDPAR0=177660
UDPAR1=177662
UDPAR2=177664
UDPAR3=177666
UDPAR4=177670
UDPAR5=177672
UDPAR6=177674
UDPAR7=177676

172200
172202
172204
172206
172210
172212
172214
172216

SIPDR0=172200
SIPDR1=172202
SIPDR2=172204
SIPDR3=172206
SIPDR4=172210
SIPDR5=172212
SIPDR6=172214
SIPDR7=172216

172220
172222
172224
172226
172230
172232
172234
172236

SDPOR0=172220
SDPOR1=172222
SDPOR2=172224
SDPOR3=172226
SDPOR4=172230
SDPOR5=172232
SDPOR6=172234
SDPOR7=172236

172240
172242
172244
172246
172250
172252
172254
172256

SIPAR0=172240
SIPAR1=172242
SIPAR2=172244
SIPAR3=172246
SIPAR4=172250
SIPAR5=172252
SIPAR6=172254
SIPAR7=172256

172260
172262
172264
172266
172270
172272
172274
172276

SDPAR0=172260
SDPAR1=172262
SDPAR2=172264
SDPAR3=172266
SDPAR4=172270
SDPAR5=172272
SDPAR6=172274
SDPAR7=172276

172300
172302
172304
172306
172310
172312
172314
172316

KIPDR0=172300
KIPDR1=172302
KIPDR2=172304
KIPDR3=172306
KIPDR4=172310
KIPDR5=172312
KIPDR6=172314
KIPDR7=172316

172320

KDPDR0=172320

172322
172324
172326
172330
172332
172334
172336

KDPDR1=172322
KDPDR2=172324
KDPDR3=172326
KDPDR4=172330
KDPDR5=172332
KDPDR6=172334
KDPDR7=172336

172340
172342
172344
172346
172350
172352
172354
172356

KIPAR0=172340
KIPAR1=172342
KIPAR2=172344
KIPAR3=172346
KIPAR4=172350
KIPAR5=172352
KIPAR6=172354
KIPAR7=172356

172360
172362
172364
172366
172370
172372
172374
172376

KDPAR0=172360
KDPAR1=172362
KDPAR2=172364
KDPAR3=172366
KDPAR4=172370
KDPAR5=172372
KDPAR6=172374
KDPAR7=172376

177600
177620
177640
177660
172200
172220
172240
172260
172300
172320
172340
172360

UIPDR=177600
UDPDR=177620
UIPAR=177640
UPIPAR=177660
SIPDR=172200
SDPDR=172220
SIPAR=172240
SDPAR=172260
KIPDR=172300
KDPDR=172320
KIPAR=172340
KDPAR=172360

000000
000001
000002
000003
000004
000005
000006
000007

;ACCESS CONTROL FIELD DEFINITIONS (IN PDR)
NR0=0 ;NON-RESIDENT ABORT ALL REFS.
RDOT=1 ;TRAP ON READ,ABORT ON WRITE
RDO=2 ;READ,ABORT ON WRITE
NR3=3 ;UNUSED ABORT ALL
RWT=4 ;TRAP ON READ & WRITE
RWTW=5 ;READ,TRAP ON WRITE
RW=6 ;READ & WRITE
NR7=7 ;ABORT ALL

000240
000000
104000

;INSTUCTION EQUATES
NOP=240
HLT=HALT
SCOPE=EMT ;SCOPE IS AN EMT INSTRUCTION

;LOAD TRAP/INTERRUPT VECTTOR AREA 0-1000 WITH


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:
:      +2
:      HALT
: CAUSES UNEXPECTED TRAPS/INTERRUPTS TO HALT AT VECTOR ADDRESS +2
: NOTE: LISTING DOES NOT REFLECT THIS LOAD

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.NLIST MC,MD,SEQ
.LIST ME
.=ERRVEC
.WORD SHLT
.=EMTVEC
.WORD SCOPEA
.=46
$ENDAD
.=52
40000
.=MMVEC
.WORD MMERR
.=200
JMP START ;GO START TEST
.=400
: ROUTINE TO CATCH HLT (HALT) TRAP (IN SUPER & USER MODES) AND RETURN PRO-
: GRAM TO HLT INSTRUCTION IN KERNEL MODE.
000004 000004
000030 000030
000046 015332
000052 040000
000250 000250
000200 000167 000664
000400 042737 000001 177572 SHLT: BIC #1,@SR0 ;DISABLE MEMORY MANAGEMENT
000406 162716 000002 SUB #2,(KSP) ;POINT PC TO INST THAT CAUSED THE TRAP
000412 005776 000000 TST #2(KSP) ;WAS IT THE HLT?
000416 001404 BEQ SHLTA
000420 062716 000002 ADD #2,(KSP) ;NO
000424 000137 000006 JMP #6 ;GO HALT AT 6
000430 042766 140000 000002 SHLTA: BIC #UM,2(KSP) ;SET UP TO RETURN IN KERNEL MODE
000436 000006 RTT ;RETURN IN KERNEL MODE

:SCOPE (EMT) TRAP SERVICE
SCOPEA: MOV (KSP),R1 ;SAVE ADDRESS OF THIS TEST
MOV #KPTR,KSP ;RESET STACK POINTER
CLR -(KSP)
MOV R1, -(KSP)
MOV #SPTR, -(KSP) ;PUSH SUPER STACK PTR ONTO STACK
MOV #UPTR, -(KSP) ;PUSH USER STACK PTR ONTO STACK
MOV #PUM,PSW ;KERNEL MODE!!! PREV USER MODE!!
MTPD USP ;SET USER STACK PTR
ASR PSW ;KERNEL MODE!!! PREV SUPER MODE!!
MTPD SSP ;SET SUPER STACK PTR
BIT #BITB,SWR ;CHECK MICRO BREAK OPTION
BEQ SCOPEX
SCOPEX: MOVB SWR,UBREAK ;MOV SR 0-7 INTO MICRO BREAK REG.
RTT ;RETURN IN KERNEL MODE

:MEMORY MANAGEMENT ERROR TRAP SERVICE
MMERR: MOV @SR0,SROT ;SAVE SRO
BIC #177776,@SR0
JMP @MMVEC+2 ;GO HALT AT 252

.=1000
:TAGS
ICNT: 0 ;CONTAINS PASS COUNT
SROT: 0 ;CONTAINS SRO CONTENTS ON ERROR

```


NO1

001004
001012
001070

TEMP=.
.=+6
.=1070


```

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

001076 016737 177676 177570 BEGIN:  MOV      ICNT, @LIGHTS ;DISPLAY PASS COUNT
001104 012706 001060      MOV      @KPTR, KSP ;SET KERNEL STACK PTR
001110 104000      SCOPE
001112 012737 000520 000250      MOV      @MMERR, @MMVEC
001120 012737 000400 177774      MOV      @400, @SLR ;SET STACK LIMIT =1000
001126 012737 000007 172516      MOV      @UDE+@SDE+KDE, @SR3
    
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:ROUTINE TO CLEAR MEMORY MANAGEMENT REGISTERS.
001134 000240      SEGO:  NOP
001136 005037 177572      CLR      @SR0
001142 012702 177600      MOV      @UIPDR0, R2
001146 012703 000040      MOV      @40, R3
001152 005022      CLR      (R2)+
001154 077302      SOB      R3, -2
001156 012702 172200      MOV      @SIPDR0, R2
001162 012703 000100      MOV      @100, R3
001166 005022      CLR      (R2)+
001170 077302      SOB      R3, -2
    
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:ROUTINE TO SET UP MEMORY MANAGEMENT REGISTERS FOR TESTS
001172
001172 012737 073006 172300      MOV      @167*256.-400+UP+RW, @KIPDR0 ;LOAD KIPDR0 RW UP 167 BLOCKS
001200 012737 004006 172320      MOV      @11*256.-400+UP+RW, @KDPDR0 ;LOAD KDPDR0 RW UP 11 BLOCKS
001206 012737 000006 172334      MOV      @1*256.-400+UP+RW, @KDPDR6 ;LOAD KDPDR6 RW UP 1 BLOCKS
001214 012737 077406 172336      MOV      @128*256.-400+UP+RW, @KDPDR7 ;LOAD KDPDR7 RW UP 128. BLOCKS
001222 012737 000006 172222      MOV      @1*256.-400+UP+RW, @SDPAR1 ;LOAD SDPAR1 RW UP 1 BLOCKS
001230 012737 000006 172204      MOV      @1*256.-400+UP+RW, @SIPDR2 ;LOAD SIPDR2 RW UP 1 BLOCKS
001236 012737 000006 177630      MOV      @1*256.-400+UP+RW, @UDPDR4 ;LOAD UDPDR4 RW UP 1 BLOCKS
001244 012737 000006 177612      MOV      @1*256.-400+UP+RW, @UIPDR5 ;LOAD UIPDR5 RW UP 1 BLOCKS
001252 005067 171062      CLR      KIPAR0 ;VA=PA=0000-12077
001256 005067 171076      CLR      KDPAR0 ;VA=PA=0-1077
001262 012767 000167 171104      MOV      @167, KDPAR6 ;VA=140000-140077;PA=16700-16777
001270 012767 007600 171100      MOV      @7600, KDPAR7 ;VA=160000-177776,PA=760000-777776
                                ;(I/O PAGE)
001276 012767 000170 170740      MOV      @170, SIPAR2 ;VA=40000-40077/PA=17000-17077 (SUPER I SPACE)
001304 012767 000171 170750      MOV      @171, SDPAR1 ;VA=20000-20077/PA=17100-17177 (SUPER D SPACE)

001312 012767 000172 176332      MOV      @172, UIPARS ;VA=120000-120077/PA=17200-17277 (USER I SPACE)
001320 012767 000173 176342      MOV      @173, UDPAR4 ;VA=100000-100077/PA=17300-17377 (USER D SPACE)
001326 000400      BR      KKOA ;GO START TEST
    
```



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;TEST MFPD INSTRUCTION KERNEL MODE PREVIOUS KERNEL MODE.
;KERNEL VIRTUAL 'D' ADDRESS FOR THESE TESTS
;CORRESPONDING KERNEL PHYSICAL 'D' ADDRESS
140000
016700
VIRT=140000
PHYS=16700

;TEST THAT MFPD CAN GET DATA FROM A GENERAL REGISTER (R3)
KK0A:
001330 001330 012767 000340 176440 MOV @PRTY7,PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
001336 005066 177776 CLR -2(KSP)
001342 012703 177777 MOV @-1,R3 ;PRESET GENERAL REGISTER
001346 005237 177572 INC @SRO ;ENABLE SEG
001352 106503 MFPD R3 ;--(KSP)+R3
001354 016702 176416 MOV PSW,R2 ;SAVE CC'S
001360 005037 177572 CLR @SRO ;DISABLE SEG
001364 122702 000350 CMPB @PRTY7+N,R2 ;CHECK CC'S
001370 001401 BEQ .+4
001372 000000 HLT ;ERROR! INCORRECT CC'S AFTER MFPD
001374 022706 001056 CMP #KPTR-2,KSP ;CHECK THAT STACK WAS PUSHED
001400 001401 BEQ .+4
001402 000000 HLT ;ERROR! INCORRECT STACK PTR
001404 005216 INC (KSP) ;CHECK RESULT
001406 001401 BEQ .+4
001410 000000 HLT ;ERROR! INCORRECT RESULT
001412 104000 SCOPE

;TEST THAT MFPD CAN GET DATA FROM A KERNEL VIRTUAL 'D' ADDRESS
;DM=1
001414 005067 176356 CLR PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
001420 005066 177776 CLR -2(KSP)
001424 012702 140000 MOV @VIRT,R2 ;R2=VIRTUAL ADDRESS
001430 012737 177777 016700 MOV @-1,@PHYS ;PRESET PHYSICAL ADDRESS
001436 005237 177572 INC @SRO ;ENABLE SEG
001442 000277 SCC ;PRESET CC'S
001444 106512 MFPD (R2) ;--(KSP)+(R2)
001446 016703 176324 MOV PSW,R3 ;SAVE CC'S
001452 005037 177572 CLR @SRO ;DISABLE SEG
001456 122703 000011 CMPB @N+C,R3 ;CHECK CC'S
001462 001401 BEQ .+4
001464 000000 HLT ;ERROR! INCORRECT CC'S
001466 022706 001056 CMP #KPTR-2,KSP ;CHECK THAT STACK WAS PUSHED
001472 001401 BEQ .+4
001474 000000 HLT ;ERROR! INCORRECT STACK PTR
001476 005216 INC (KSP) ;CHECK RESULT
001500 001401 BEQ .+4
001502 000000 HLT ;ERROR! INCORRECT RESULT
001504 104000 SCOPE

;DM=2
001506 012767 004000 176262 MOV @REG,PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
001514 012766 177777 177776 MOV @-1,-2(KSP)
001522 012702 140000 MOV @VIRT,R12 ;R12=VIRTUAL ADDRESS
001526 005037 016700 CLR @PHYS ;PRESET PHYSICAL ADDRESS
001532 005237 177572 INC @SRO ;ENABLE SEG
001536 106522 MFPD (R12)+ ;--(KSP)+VIRT
001540 005037 177572 CLR @SRO ;DISABLE SEG
001544 005716 TST (KSP) ;CHECK RESULT
001546 001401 BEQ .+4

```


001550	000000			HLT		;ERROR! INCORRECT RESULT ON STACK
001552	022702	140002		CMP	@VIRT+2,R12	;CHECK AUTO INCREMENT
001556	001401			BEQ	+.4	
001560	000000			HLT		;ERROR! AUTO INCREMENT FAILED
001562	005067	176210		CLR	PSW	
001566	104000			SCOPE		
;DM=3						
001570	005067	176202		CLR	PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
001574	005066	177776		CLR	-2(KSP)	
001600	012702	140000		MOV	@VIRT,R2	;LOAD INDIRECT ADDRESS
001604	012737	140002	016700	MOV	@VIRT+2,@PHYS	;LOAD ADDRESS
001612	012737	177777	016702	MOV	@-1,@PHYS+2	;PRESET DATA
001620	005237	177572		INC	@SRO	;ENABLE SEG
001624	106532			MFPD	@(R2)+	;-(KSP)+VIRT
001626	005037	177572		CLR	@SRO	;DISABLE SEG
001632	005216			INC	(KSP)	;CHECK RESULT
001634	001401			BEQ	+.4	
001636	000000			HLT		;ERROR! INCORRECT RESULT
001640	104000			SCOPE		
;DM=4						
001642	005067	176130		CLR	PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
001646	012766	177777	177776	MOV	@-1,-2(KSP)	
001654	012704	140002		MOV	@VIRT+2,R4	;R4=VIRTUAL ADDRESS+2
001660	005037	016700		CLR	@PHYS	;PRESET PHYSICAL ADDRESS DATA
001664	005237	177572		INC	@SRO	;ENABLE SEG
001670	106544			MFPD	-(R4)	;-(KSP)+VIRT
001672	005037	177572		CLR	@SRO	;DISABLE SEG
001676	022704	140000		CMP	@VIRT,R4	;CHECK AUTO-DECREMENT
001702	001401			BEQ	+.4	
001704	000000			HLT		;ERROR! AUTO-DECREMENT FAILED
001706	005716			TST	(KSP)	;CHECK RESULT
001710	001401			BEQ	+.4	
001712	000000			HLT		;ERROR! INCORRECT RESULT
;DM=5						
001714	012767	004000	176054	MOV	@REG,PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
001722	005066	177776		CLR	-2(KSP)	
001726	012700	140002		MOV	@VIRT+2,R10	;R10=INDIRECT ADDRESS
001732	012737	140004	016700	MOV	@VIRT+4,@PHYS	;LOAD ADDRESS
001740	012737	177777	016704	MOV	@-1,@PHYS+4	;PRESET PHYSICAL ADDRESS DATA
001746	005237	177572		INC	@SRO	;ENABLE SEG
001752	106550			MFPD	@-(R10)	;-(KSP)+VIRT+4
001754	005037	177572		CLR	@SRO	;DISABLE SEG
001760	005216			INC	(KSP)	;CHECK RESULT
001762	001401			BEQ	+.4	
001764	000000			HLT		
001766	005067	176004		CLR	PSW	
001772	104000			SCOPE		
;DM=6						
001774	012767	004000	175774	MOV	@REG,PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
002002	012766	177777	177776	MOV	@-1,-2(KSP)	
002010	012702	000002		MOV	@2,R12	;LOAD INDEX REGISTER
002014	005037	016702		CLR	@PHYS+2	;PRESET PHYSICAL ADDRESS DATA


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002020 005237 177572
002024 106562 140000
002030 005037 177572
002034 022706 001056
002040 001401
002042 000000
002044 005716
002046 001401
002050 000000
002052 005067 175720
002056 104000

KK6: INC @#SRO ;ENABLE SEG
MFPD VIRT(R12) ;-(KSP)+VIRT-2
CLR @#SRO ;DISABLE SEG
CMP #KPTR-2,KSP ;CHECK STACK PTR
BEQ .+4
HLT ;ERROR! INCORRECT STACK PTR
TST (KSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
CLR PSW
SCOPE

;DM=7
002060 005067 175712
002064 005066 177776
002070 012702 000004
002074 012737 140000 016704
002102 012737 177777 016700
002110 005237 177572
002114 106572 140000
002120 005037 177572
002124 005216
002126 001401
002130 000000
002132 104000

KK7: CLR PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
CLR -2(KSP)
MOV #4,R2 ;LOAD INDEX REGISTER
MOV #VIRT,@#PHYS+4 ;LOAD ADDRESS
MOV #-1,@#PHYS ;CLEAR PHYSICAL ADDRESS DATA
INC @#SRO ;ENABLE SEG
MFPD @VIRT(R2) ;-(KSP)+VIRT
CLR @#SRO ;DISABLE SEG
INC (KSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

;TEST THAT MFPD OPERATES PROPERLY WITH PC USED IN DESTINATION
;DM=0,PC
002134 005067 175636
002140 012706 001060
002144 005066 177776
002150 005237 177572
002154 000277
002156 106507
002160 016702 175612
002164 005037 177572
002170 122702 000001
002174 001401
002176 000000
002200 022706 001056
002204 001401
002206 000000
002210 022716 002160
002214 001401
002216 000000
002220 104000

KK10: CLR PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
MOV #KPTR,KSP ;SET KERNEL STACK PTR
CLR -2(KSP)
INC @#SRO ;ENABLE SEG
SCC
MFPD PC ;-(KSP)+PC
MOV PSW,R2 ;SAVE CC'S
CLR @#SRO ;DISABLE SEG
CMPB #C,R2 ;CHECK CC'S
BEQ .+4
HLT
CMP #KPTR-2,KSP ;CHECK STACK PTR
BEQ .+4
HLT ;ERROR! STACK NOT PUSHED
CMP #KK10+2,(KSP) ;CHECK THAT PS WAS PUSHED ON THE STACK
BEQ .+4
HLT ;ERROR! PC NOT PUSHED ON THE STACK
SCOPE

;DM=3
002222 012767 004000 175546
002230 005066 177776
002234 012737 177777 016700
002242 005237 177572
002246 106537 140000
002252 005037 177572

KK11: MOV #REG,PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
CLR -2(KSP)
MOV #-1,@#PHYS
INC @#SRO ;ENABLE SEG
MFPD @#VIRT ;-(KSP)+VIRT
CLR @#SRO ;DISABLE SEG

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002256 005216          INC      (KSP)          ;CHECK RESULT
002260 001401          BEQ      .+4
002262 000000          HLT
002264 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=6,PC
002266 012767 000340 175502  MOV      @PRTY7,PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
002274 012766 177777 177776  MOV      @-1,-2(KSP)
002302 005037 016700          CLR      @#PHYS          ;PRESET PHYSICAL ADDRESS DATA
002306 005237 177572          INC      @#SRO          ;ENABLE SEG
002312 106567 135462  KK12:  MFPD  VIRT          ;-(KSP)+VIRT
002316 005037 177572          CLR      @#SRO          ;DISABLE SEG
002322 005716          TST      (KSP)          ;CHECK RESULT
002324 001401          BEQ      .+4
002326 000000          HLT
002330 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=7,PC
002332 005067 175440          CLR      PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
002336 005066 177776          CLR      -2(KSP)
002342 012737 140004 016702  MOV      @VIRT+4,@#PHYS+2 ;LOAD ADDRESS
002350 012737 177777 016704  MOV      @-1,@#PHYS+4 ;PRESET DATA
002356 005237 177572          INC      @#SRO          ;ENABLE SEG
002362 000277          SCC
002364 106577 135412  KK13:  MFPD  @VIRT+2          ;-(KSP+VIRT+4
002370 016702 175402          MOV      PSW,R2          ;SAVE CC'S
002374 005037 177572          CLR      @#SRO          ;DISABLE SEG
002400 122702 000011          CMPB    @N+C,R2          ;CHECK CC'S
002404 001401          BEQ      .+4
002406 000000          HLT          ;ERROR! INCORRECT CC'S
002410 005216          INC      (KSP)          ;CHECK RESULT
002412 001401          BEQ      .+4
002414 000000          HLT          ;ERROR! INCORRECT RESULT ON STACK
002416 104000          SCOPE

;DM=4,PC
002420 012737 002442 000250  MOV      @KK14A,@#MMVEC ;SET MEM MGMT ABORT TRAP VECTOR
002426 005066 177776          CLR      -2(KSP)
002432 005237 177572          INC      @#SRO          ;ENABLE SEG
002436 106547  KK14:  MFPD  -(PC)          ;SHOULD ABORT
002440 000000          HLT          ;ERROR! FAILED TO ABORT & PC FAILED TO
          ;AUTO DECREMENT

002442 022737 040021 177572  KK14A:  CMP      @PLA+DS+VPO+1,@#SRO ;CHECK ABORT CONDITIONS
002450 001401          BEQ      .+4
002452 000000          HLT          ;ERROR! INCORRECT ABORT CONDITIONS
002454 005037 177572          CLR      @#SRO          ;DISABLE SEG
002460 012737 000520 000250  MOV      @#MERR,@#MMVEC
002466 104000          SCOPE

;TEST MFPD INSTRUCTION KERNEL MODE PREVIOUS SUPERVISOR MODE
          VIRT=20000          ;SUPER VIRTUAL 'I' ADDRESS FOR THESE TESTS
          PHYS=17100          ;CORRESPONDING SUPER PHYSICAL 'I' ADDRESS

;TEST THAT MFPD CAN GET DATA FROM A GENERAL REGISTER (R10)
002470 012767 014000 175300  MOV      @PSM+REG,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
002476 012766 177777 177776  MOV      @-1,-2(KSP)
    
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002504 005000          CLR      R10          ;PRESET REGISTER
002506 005237 177572  INC      @#SRO        ;ENABLE SEG
002512 000277          SCC          ;PRESET CC'S
002514 106500          MFPD     R10          ;-(KSP)+(R10)
002516 016704 175254  MOV      PSM,R14       ;SAVE CC'S
002522 005037 177572  CLR      @#SRO        ;DISABLE SEG
002526 122704 000005  CMPB    @Z+C,R14     ;CHECK CC'S
002532 001401          BEQ      .+4
002534 000000          HLT
002536 022706 001056  CMP      @KPTR-2,KSP ;ERROR! INCORRECT CC'S
002542 001401          BEQ      .+4          ;CHECK THAT STACK PTR WAS PUSHED
002544 000000          HLT
002546 005716          TST      (KSP)        ;ERROR! INCORRECT STACK PTR
002550 001401          BEQ      .+4          ;CHECK RESULT
002552 000000          HLT
002554 005067 175216  CLR      PSM          ;ERROR! INCORRECT RESULT
002560 104000          SCOPE

;TEST THAT MFPD CAN GET DATA FROM A SUPERVISOR VIRTUAL 'I' ADDRESS
;DM=1
002562 012767 010000 175206  MOV      @KM+PSM,PSM ;KERNEL MODE!!!,PREV SUPER MODE!!
002570 005066 177776          CLR      -2(KSP)
002574 012702 020000          MOV      @VIRT,R2    ;R2=VIRTUAL ADDRESS
002600 012737 177777 017100  MOV      @-1,@#PHYS  ;PRESET PHYSICAL ADDRESS
002606 005237 177572          INC      @#SRO
002612 000277          SCC
002614 106512          MFPD     (R2)        ;PRESET CC'S
002616 016703 175154  MOV      PSM,R3       ;-(KSP)+(R2)
002622 005037 177572  CLR      @#SRO        ;SAVE CC'S
002626 122703 000011  CMPB    @N+C,R3     ;DISABLE SEG
002632 001401          BEQ      .+4          ;CHECK CC'S
002634 000000          HLT
002636 022706 001056  CMP      @KPTR-2,KSP ;ERROR! INCORRECT CC'S
002642 001401          BEQ      .+4          ;CHECK THAT STACK WAS PUSHED
002644 000000          HLT
002646 005216          INC      (KSP)        ;ERROR! INCORRECT STACK PTR
002650 001401          BEQ      .+4          ;CHECK RESULT
002652 000000          HLT
002654 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=2
002656 012767 014000 175112  MOV      @PSM+REG,PSM ;KERNEL MODE!!!,PREV SUPER MODE!!
002664 012766 177777 177776  MOV      @-1,-2(KSP)
002672 012702 020000          MOV      @VIRT,R12  ;R12=VIRTUAL ADDRESS
002676 005037 017100          CLR      @#PHYS    ;PRESET PHYSICAL ADDRESS
002702 005237 177572          INC      @#SRO
002706 106522          MFPD     (R12)+     ;ENABLE SEG
002710 005037 177572  CLR      @#SRO        ;-(KSP)+VIRT
002714 005716          TST      (KSP)        ;DISABLE SEG
002716 001401          BEQ      .+4          ;CHECK RESULT
002720 000000          HLT
002722 022702 020002  CMP      @VIRT+2,R12 ;ERROR! INCORRECT RESULT ON STACK
002726 001401          BEQ      .+4          ;CHECK AUTO INCREMENT
002730 000000          HLT
002732 005067 175040  CLR      PSM          ;ERROR! AUTO INCREMENT FAILED
002736 104000          SCOPE

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;DM=3
002740 012767 010000 175030 MOV #KM+PSM,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
002746 005066 177776 CLR -2(KSP)
002752 012702 001004 MOV #TEMP,R2 ;LOAD INDIRECT ADDRESS
002756 012737 020002 001004 MOV #VIRT+2,@#TEMP ;LOAD ADDRESS
002764 012737 177777 017102 MOV #-1,@#PHYS+2 ;PRESET DATA
002772 005237 177572 INC @#SRO ;ENABLE SEG
002776 106532 KS3: MFPD @-(R2)+ ;-(KSP)+VIRT+2
003000 005037 177572 CLR @#SRO ;DISABLE SEG
003004 005216 INC (KSP) ;CHECK RESULT
003006 001401 BEQ .+4
003010 000000 HLT
003012 104000 SCOPE ;ERROR! INCORRECT RESULT

;DM=4
003014 012767 010000 174754 MOV #KM+PSM,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
003022 012766 177777 177776 MOV #-1,-2(KSP)
003030 012704 020002 MOV #VIRT+2,R4 ;R4=VIRTUAL ADDRESS+2
003034 005037 017100 CLR @#PHYS ;PRESET PHYSICAL ADDRESS DATA
003040 005237 177572 INC @#SRO ;ENABLE SEG
003044 106544 KS4: MFPD -(R4) ;-(KSP)+VIRT
003046 005037 177572 CLR @#SRO ;DISABLE SEG
003052 022704 020000 CMP #VIRT,R4 ;CHECK AUTO-DECREMENT
003056 001401 BEQ .+4
003060 000000 HLT ;ERROR! AUTO-DECREMENT FAILED
003062 005716 TST (KSP) ;CHECK RESULT
003064 001401 BEQ .+4
003066 000000 HLT ;ERROR! INCORRECT RESULT
003070 104000 SCOPE

;DM=5
003072 012767 014000 174676 MOV #PSM+REG,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
003100 005066 177776 CLR -2(KSP)
003104 012700 001006 MOV #TEMP+2,R10 ;R10=INDIRECT ADDRESS
003110 012737 020004 001004 MOV #VIRT+4,@#TEMP ;LOAD ADDRESS
003116 012737 177777 017104 MOV #-1,@#PHYS+4 ;PRESET PHYSICAL ADDRESS DATA
003124 005237 177572 INC @#SRO ;ENABLE SEG
003130 106550 KS5: MFPD @-(R10) ;-(KSP)+VIRT+4
003132 005037 177572 CLR @#SRO ;DISABLE SEG
003136 005216 INC (KSP) ;CHECK RESULT
003140 001401 BEQ .+4
003142 000000 HLT
003144 005067 174626 CLR PSM
003150 104000 SCOPE

;DM=6
003152 012767 014000 174616 MOV #PSM+REG,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
003160 012766 177777 177776 MOV #-1,-2(KSP)
003166 012702 000002 MOV #2,R12 ;LOAD INDEX REGISTER
003172 005037 017102 CLR @#PHYS+2 ;PRESET PHYSICAL ADDRESS DATA
003176 005237 177572 INC @#SRO ;ENABLE SEG
003202 106562 KS6: MFPD VIRT(R12) ;-(KSP)+VIRT-2
003206 005037 177572 CLR @#SRO ;DISABLE SEG
003212 022706 001056 CMP #KPTR-2,KSP ;CHECK STACK PTR
003216 001401 BEQ .+4

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003220 000000          HLT          ;ERROR! INCORRECT STACK PTR
003222 005716          TST          (KSP)      ;CHECK RESULT
003224 001401          BEQ          .+4
003226 000000          HLT          ;ERROR! INCORRECT RESULT
003230 005067 174542   CLR          PSW
003234 104000          SCOPE

;DM=7
003236 012767 010000 174532  MOV      #KM+PSM,PSW      ;KERNEL MODE!!!,PREV SUPER MODE!!
003244 005066 177776          CLR      -2(KSP)
003250 012702 177774          MOV      @-4,R2          ;LOAD INDEX REGISTER
003254 012737 020000 001004  MOV      @VIRT,@TEMP     ;LOAD ADDRESS
003262 012737 177777 017100  MOV      @-1,@PHYS      ;CLEAR PHYSICAL ADDRESS DATA
003270 005237 177572          INC      @SR0           ;ENABLE SEG
003274 106572 001010  KS7:   MFPD     @TEMP+4(R2)      ;-(KSP)+VIRT
003300 005037 177572          CLR      @SR0           ;DISABLE SEG
003304 005216          INC      (KSP)          ;CHECK RESULT
003306 001401          BEQ          .+4
003310 000000          HLT          ;ERROR! INCORRECT RESULT
003312 104000          SCOPE

;TEST THAT MFPD OPERATES PROPERLY US PC IN DESTINATION
;CM=0,PC
003314 012767 010000 174454  MOV      #KM+PSM,PSW      ;KERNEL MODE!!!,PREV SUPER MODE!!
003322 005066 177776          CLR      -2(KSP)
003326 005237 177572          INC      @SR0           ;ENABLE SEG
003332 000277          SCC
003334 106507  KS10:  MFPD     PC          ;-(KSP)+PC
003336 016702 174434          MOV      PSW,R2         ;SAVE CC'S
003342 005037 177572          CLR      @SR0           ;DISABLE SEG
003346 122702 000001          CMPB    @C,R2          ;CHECK CC'S
003352 001401          BEQ          .+4
003354 000000          HLT
003356 022706 001056          CMP      #KPTR-2,KSP    ;CHECK STACK PTR
003362 001401          BEQ          .+4
003364 000000          HLT          ;ERROR! STACK NOT PUSHED
003366 022716 003336          CMP      #KS10+2,(KSP) ;CHECK THAT PS WAS PUSHED ON THE STACK
003372 001401          BEQ          .+4
003374 000000          HLT          ;ERROR! PC NOT PUSHED ON THE STACK
003376 104000          SCOPE

;DM=3
003400 012767 014000 174370  MOV      #PSM+REG,PSW    ;KERNEL MODE!!!,PREV SUPER MODE!!
003406 005066 177776          CLR      -2(KSP)
003412 012737 177777 017100  MOV      @-1,@PHYS
003420 005237 177572          INC      @SR0           ;ENABLE SEG
003424 106537 020000  KS11:  MFPD     @VIRT      ;-(KSP)+VIRT
003430 005037 177572          CLR      @SR0           ;DISABLE SEG
003434 005216          INC      (KSP)          ;CHECK RESULT
003436 001401          BEQ          .+4
003440 000000          HLT          ;ERROR! INCORRECT RESULT
003442 104000          SCOPE

;DM=6,PC

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003444 012767 010340 174324      MOV      #PSM+PTY7,PSW ;KERNEL MODE!!!, PREV SUPER MODE!!
003452 012766 177777 177776      MOV      #-1,-2(KSP)
003460 005037 017100      CLR      @#PHYS ;PRESET PHYSICAL ADDRESS DATA
003464 005237 177572      INC      @#SRO ;ENABLE SEG
003470 106567 014304      MFPD    VIRT ;-(KSP)+VIRT
003474 005037 177572      CLR      @#SRO ;DISABLE SEG
003500 005716      TST     (KSP) ;CHECK RESULT
003502 001401      BEQ     .+4
003504 000000      HLT
003506 104000      SCOPE ;ERROR! INCORRECT RESULT

;DM=7,PC
003510 012767 010000 174260      MOV      #KM+PSM,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
003516 005066 177776      CLR      -2(KSP)
003522 012737 020004 001004      MOV      @VIRT+4,@TEMP ;LOAD ADDRESS
003530 012737 177777 017104      MOV      #-1,@#PHYS+4 ;PRESET DATA
003536 005237 177572      INC      @#SRO ;ENABLE SEG
003542 000277      SCC
003544 106577 175234      MFPD    @TEMP' ;-(KSP)+VIRT+4
003550 016702 174222      MOV      PSW,R2 ;SAVE CC'S
003554 005037 177572      CLR      @#SRO ;DISABLE SEG
003560 122702 000011      CMPB   #N+C,R2 ;CHECK CC'S
003564 001401      BEQ     .+4
003566 000000      HLT ;ERROR! INCORRECT CC'S
003570 005216      INC     (KSP) ;CHECK RESULT
003572 001401      BEQ     .+4
003574 000000      HLT ;ERROR! INCORRECT RESULT ON STACK
003576 104000      SCOPE

;TEST THAT MFPD CAN PUSH SUPERVISOR STACK PTR ONTO KERNEL STACK
003600 012767 010000 174170      MOV      #KM+PSM,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
003606 005016      CLR      (KSP) ;PUT #0 ON KERNEL STACK
003610 106606      MTPD    SSP ;SET SUPER STACK PTR
003612 012716 177777      MOV      #-1,(KSP) ;PUT #-1 ON KERNEL STACK
003616 005237 177572      INC      @#SRO ;ENABLE SEG
003622 106506      MFPD    SSP ;-(KSP)+SSP
003624 005037 177572      CLR      @#SRO ;DISABLE SEG
003630 005716      TST     (KSP) ;CHECK THAT SUPER STACK PTR WAS PUSHED
003632 001401      BEQ     .+4 ;ONTO KERNEL STACK
003634 000000      HLT ;ERROR! MFPD FAILED
003636 104000      SCOPE

;TEST MFPD INSTRUCTION KERNEL MODE PREVIOUS USER MODE
100000      VIRT=100000 ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
017300      PHYS=17300 ;CORRESPONDING USER PHYSICAL 'I' ADDRESS

;TEST THAT MFPD CAN GET DATA FROM A GENERAL REGISTER (R10).
003640 012767 034000 174130      MOV      #PUM+REG,PSW ;KERNEL MODE!!!,PREV USER MODE!!
003646 012766 177777 177776      MOV      #-1,-2(KSP)
003654 005000      CLR      R10 ;PRESET REGISTER
003656 005237 177572      INC      @#SRO ;ENABLE SEG
003662 000277      SCC ;PRESET CC'S
003664 106500      MFPD    R10 ;-(KSP)+(R10)
003666 016704 174104      MOV      PSW,R14 ;SAVE CC'S
003672 005037 177572      CLR      @#SRO ;DISABLE SEG
    
```



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003676 122704 000005      CMPB    #Z+C,R14      ;CHECK CC'S
003702 001401      BEQ     .+4
003704 000000      HLT
003706 022706 001056      CMP     #KPTR-2,KSP  ;ERROR! INCORRECT CC'S
                                ;CHECK THAT STACK PTR WAS PUSHED
003712 001401      BEQ     .+4
003714 000000      HLT
003716 005716      TST     (KSP)        ;ERROR! INCORRECT STACK PTR
                                ;CHECK RESULT
003720 001401      BEQ     .+4
003722 000000      HLT
003724 005067 174046      CLR     PSW          ;ERROR! INCORRECT RESULT
003730 104000      SCOPE

```

;TEST THAT MFPD CAN GET DATA FROM A KERNEL VIRTUAL 'I' ADDRESS

```

;DM=1
003732 012767 030000 174036      MOV     #KM+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
003740 005066 177776      CLR     -2(KSP)
003744 012702 100000      MOV     #VIRT,R2    ;R2=VIRTUAL ADDRESS
003750 012737 177777 017300      MOV     #-1,@#PHYS  ;PRESET PHYSICAL ADDRESS
003756 005237 177572      INC     @#SRO
003762 000277      SCC
003764 106512      MFPD   (R2)        ;PRESET CC'S
                                ;-(KSP)+(R2)
003766 016703 174004      MOV     PSW,R3      ;SAVE CC'S
003772 005037 177572      CLR     @#SRO
003776 122703 000011      CMPB   #N+C,R3     ;DISABLE SEG
                                ;CHECK CC'S
004002 001401      BEQ     .+4
004004 000000      HLT
004006 022706 001056      CMP     #KPTR-2,KSP ;ERROR! INCORRECT CC'S
                                ;CHECK THAT STACK WAS PUSHED
004012 001401      BEQ     .+4
004014 000000      HLT
004016 005216      INC     (KSP)
004020 001401      BEQ     .+4
004022 000000      HLT
004024 104000      SCOPE
                                ;CHECK RESULT
                                ;ERROR! INCORRECT RESULT

```

;DM=2

```

004026 012767 034000 173742      MOV     #PUM+REG,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004034 012766 177777 177776      MOV     #-1,-2(KSP)
004042 012702 100000      MOV     #VIRT,R12  ;R12=VIRTUAL ADDRESS
004046 005037 017300      CLR     @#PHYS     ;PRESET PHYSICAL ADDRESS
004052 005237 177572      INC     @#SRO
004056 106522      MFPD   (R12)+      ;ENABLE SEG
                                ;-(KSP)+VIRT
004060 005037 177572      CLR     @#SRO
004064 005716      TST     (KSP)
004066 001401      BEQ     .+4
004070 000000      HLT
004072 022702 100002      CMP     #VIRT+2,R12 ;ERROR! INCORRECT RESULT ON STACK
                                ;CHECK AUTO INCREMENT
004076 001401      BEQ     .+4
004100 000000      HLT
004102 005067 173670      CLR     PSW
004106 104000      SCOPE
                                ;ERROR! AUTO INCREMENT FAILED

```

;DM=3

```

004110 012767 030000 173660      MOV     #KM+PUM,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004116 005066 177776      CLR     -2(KSP)
004122 012702 001004      MOV     #TEMP,R2   ;LOAD INDIRECT ADDRESS
004126 012737 100002 001004      MOV     #VIRT+2,@#TEMP ;LOAD ADDRESS

```


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;DM=7
004404 012767 030000 173364 MOV #KM+PUM,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004412 005066 177776 CLR -2(KSP)
004416 012702 177774 MOV #4,R2 ;LOAD INDEX REGISTER
004422 012737 100000 001004 MOV #VIRT,@TEMP ;LOAD INDIRECT ADDRESS
004430 012737 177777 017300 MOV #1,@PHYS ;CLEAR PHYSICAL ADDRESS DATA
004436 005237 177572 INC @SRO ;ENABLE SEG
004442 106572 001010 KU7: MFPD @TEMP+4(R2) ;-(KSP)+VIRT
004446 005037 177572 CLR @SRO ;DISABLE SEG
004452 005216 INC (KSP) ;CHECK RESULT
004454 001401 BEQ .+4
004456 000000 HLT
004460 104000 SCOPE ;ERROR! INCORRECT RESULT

;TEST THAT MFPD OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
004462 012767 030000 173306 MOV #KM+PUM,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004470 005066 177776 CLR -2(KSP)
004474 005237 177572 INC @SRO ;ENABLE SEG
004500 000277 SCC
004502 106507 KU10: MFPD PC ;-(KSP)+PC
004504 016702 173266 MOV PSW,R2 ;SAVE CC'S
004510 005037 177572 CLR @SRO ;DISABLE SEG
004514 122702 000001 CMPB #C,R2 ;CHECK CC'S
004520 001401 BEQ .+4
004522 000000 HLT
004524 022706 001056 CMP #KPTR-2,KSP ;CHECK STACK PTR
004530 001401 BEQ .+4
004532 000000 HLT ;ERROR! STACK NOT PUSHED
004534 022716 004504 CMP #KU10+2,(KSP) ;CHECK THAT PS WAS PUSHED ON THE STACK
004540 001401 BEQ .+4
004542 000000 HLT ;ERROR! PC NOT PUSHED ON THE STACK
004544 104000 SCOPE

;DM=3,PC
004546 012767 034000 173222 MOV #PUM+REG,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004554 005066 177776 CLR -2(KSP)
004560 012737 177777 017300 MOV #1,@PHYS
004566 005237 177572 INC @SRO ;ENABLE SEG
004572 106537 100000 KU11: MFPD @VIRT ;-(KSP)+VIRT
004576 005037 177572 CLR @SRO ;DISABLE SEG
004602 005216 INC (KSP) ;CHECK RESULT
004604 001401 BEQ .+4
004606 000000 HLT ;ERROR! INCORRECT RESULT
004610 104000 SCOPE

;DM=6,PC
004612 012767 030340 173156 MOV #PUM+PTY7,PSW ;KERNEL MODE!!!,PREV USER MODE!!
004620 012766 177777 177776 MOV #1,-2(KSP)
004626 005037 017300 CLR @PHYS ;PRESET PHYSICAL ADDRESS DATA
004632 005237 177572 INC @SRO ;ENABLE SEG
004636 106567 073136 KU12: MFPD VIRT ;-(KSP)+VIRT
004642 005037 177572 CLR @SRO ;DISABLE SEG
004646 005716 TST (KSP) ;CHECK RESULT

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004550 001401          BEQ      .+4
004652 000000          HLT
004654 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=7,PC
004656 012767 030000 173112 MOV      #KM+PUM,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
004664 005066 177776          CLR      -2(KSP)
004670 012737 100004 001004 MOV      #VIRT+4,@TEMP ;LOAD ADDRESS
004676 012737 177777 017304 MOV      #-1,@PHYS+4 ;PRESET DATA
004704 005237 177572          INC      @SRO           ;ENABLE SEG
004710 000277          SCC
004712 106577 174066 KU13: MFPD   @TEMP           ;-(KSP)+VIRT+4
004716 016702 173054          MOV      PSW,R2        ;SAVE CC'S
004722 005037 177572          CLR      @SRO           ;DISABLE SEG
004726 122702 000011          CMPB    #N+C,R2        ;CHECK CC'S
004732 001401          BEQ      .+4
004734 000000          HLT          ;ERROR! INCORRECT CC'S
004736 005216          INC      (KSP)         ;CHECK RESULT
004740 001401          BEQ      .+4
004742 000000          HLT          ;ERROR! INCORRECT RESULT ON STACK
004744 104000          SCOPE

;TEST THAT MFPD CAN PUSH USER STACK PTR ONTO KERNEL STACK
004746 012767 030000 173022 MOV      #KM+PUM,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
004754 012716 177777          MOV      #-1,(KSP)     ;PUT #-1 ON KERNEL STACK
004760 106606          MTPD   USP
004762 005016          CLR      (KSP)         ;PUT #0 ON KERNEL STACK
004764 005237 177572          INC      @SRO           ;ENABLE SEG
004770 106506          MFPD   USP
004772 005037 177572          CLR      @SRO           ;DISABLE SEG
004776 005216          INC      (KSP)         ;CHECK THAT USER STACK PTR WAS PUSHED
005000 001401          BEQ      .+4          ;ONTO KERNEL STACK
005002 000000          HLT          ;ERROR! MFPD FAILED
005004 104000          SCOPE

;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS KERNEL MODE.
016600          VIRT=16600           ;KERNEL VIRTUAL 'I' ADDRESS FOR THESE TESTS
016600          PHYS=16600        ;CORRESPONDING KERNEL PHYSICAL 'I' ADDRESS

;TEST THAT MFPI CAN GET DATA FROM A GENRAL REGISTER (R3)
005006          KK10A:
005006 012767 000340 172762 MOV      #PTY7,PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
005014 005066 177776          CLR      -2(KSP)
005020 012703 177777          MOV      #-1,R3        ;PRESET GENERAL REGISTER
005024 005237 177572          INC      @SRO           ;ENABLE SEG
005030 006503          MFPD   R3             ;-(KSP)+R3
005032 016702 172740          MOV      PSW,R2        ;SAVE CC'S
005036 005037 177572          CLR      @SRO           ;DISABLE SEG
005042 122702 000350          CMPB    #PTY7+N,R2     ;CHECK CC'S
005046 001401          BEQ      .+4
005050 000000          HLT          ;ERROR! INCORRECT CC'S AFTER MFPI
005052 022706 001056          CMP      #KPTR-2,KSP   ;CHECK THAT STACK WAS PUSHED
005056 001401          BEQ      .+4
005060 000000          HLT          ;ERROR! INCORRECT STACK PTR
005062 005216          INC      (KSP)         ;CHECK RESULT

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005064 001401          BEQ      .+4
005066 000000          HLT
005070 104000          SCOPE

;TEST THAT MFPI CAN GET DATA FROM A KERNEL VIRTUAL 'I' ADDRESS
;DM=1
005072 005067 172700          CLR      PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
005076 005066 177776          CLR      -2(KSP)
005102 012702 016600          MOV      @VIRT,R2    ;R2=VIRTUAL ADDRESS
005106 012737 177777 016600      MOV      @-1,@#PHYS  ;PRESET PHYSICAL ADDRESS
005114 005237 177572          INC      @#SRO        ;ENABLE SEG
005120 000277          SCC
005122 006512          MFPI     (R2)        ;PRESET CC'S
005124 016703 172646          MOV      PSW,R3      ;-(KSP)+(R2)
005130 005037 177572          CLR      @#SRO        ;SAVE CC'S
005134 122703 000011      CMPB     @#C,R3      ;DISABLE SEG
005140 001401          BEQ      .+4          ;CHECK CC'S
005142 000000          HLT
005144 022706 001056          CMP      @KPTR-2,KSP ;ERROR! INCORRECT CC'S
005150 001401          BEQ      .+4          ;CHECK THAT STACK WAS PUSHED
005152 000000          HLT
005154 005216          INC      (KSP)        ;ERROR! INCORRECT STACK PTR
005156 001401          BEQ      .+4          ;CHECK RESULT
005160 000000          HLT
005162 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=2
005164 012767 004000 172604      MOV      @REG,PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
005172 012766 177777 177776      MOV      @-1,-2(KSP)
005200 012702 016600          MOV      @VIRT,R12   ;R12=VIRTUAL ADDRESS
005204 005037 016600          CLR      @#PHYS      ;PRESET PHYSICAL ADDRESS
005210 005237 177572          INC      @#SRO        ;ENABLE SEG
005214 006522          MFPI     (R12)+      ;-(KSP)+VIRT
005216 005037 177572          CLR      @#SRO        ;DISABLE SEG
005222 005716          TST      (KSP)        ;CHECK RESULT
005224 001401          BEQ      .+4
005226 000000          HLT
005230 022702 016602          CMP      @VIRT+2,R12 ;ERROR! INCORRECT RESULT ON STACK
005234 001401          BEQ      .+4          ;CHECK AUTO INCREMENT
005236 000000          HLT
005240 005067 172532          CLR      PSW          ;ERROR! AUTO INCREMENT FAILED
005244 104000          SCOPE

;DM=3
005246 005067 172524          CLR      PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
005252 005066 177776          CLR      -2(KSP)
005256 012702 001004          MOV      @TEMP,R2    ;LOAD INDIRECT ADDRESS
005262 012737 016602 001004      MOV      @VIRT+2,@#TEMP ;LOAD ADDRESS
005270 012737 177777 016602      MOV      @-1,@#PHYS+2 ;PRESET DATA
005276 005237 177572          INC      @#SRO        ;ENABLE SEG
005302 006532          MFPI     @#(R2)+      ;-(KSP)+VIRT+2
005304 005037 177572          CLR      @#SRO        ;DISABLE SEG
005310 005216          INC      (KSP)        ;CHECK RESULT
005312 001401          BEQ      .+4
005314 000000          HLT
005316 104000          SCOPE          ;ERROR! INCORRECT RESULT

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;DM=4
005320 005067 172452          CLR      PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
005324 012766 177777 177776  MOV      @-1,-2(KSP)
005332 012704 016602          MOV      @VIRT+2,R4   ;R4=VIRTUAL ADDRESS+2
005336 005037 016600          CLR      @@PHYS       ;PRESET PHYSICAL ADDRESS DATA
005342 005237 177572          INC      @@SRO        ;ENABLE SEG
005346 006544          KKI4: MFPI      -(R4)   ;-(KSP)+VIRT
005350 005037 177572          CLR      @@SRO        ;DISABLE SEG
005354 022704 016600          CMP      @VIRT,R4     ;CHECK AUTO-DECREMENT
005360 001401          BEQ      .+4
005362 000000          HLT
005364 005716          TST      (KSP)        ;ERROR! AUTO-DECREMENT FAILED
005366 001401          BEQ      .+4          ;CHECK RESULT
005370 000000          HLT
005372 104000          SCOPE                ;ERROR! INCORRECT RESULT

;DM=5
005374 012767 004000 172374  MOV      @REG,PSW     ;KERNEL MODE!!!,PREV KERNEL MODE!!
005402 005066 177776          CLR      -2(KSP)
005406 012700 001006          MOV      @TEMP+2,R10  ;R10=INDIRECT ADDRESS
005412 012737 016604 001004  MOV      @VIRT+4,@TEMP ;LOAD ADDRESS
005420 012737 177777 016604  MOV      @-1,@@PHYS+4 ;PRESET PHYSICAL ADDRESS DATA
005426 005237 177572          INC      @@SRO        ;ENABLE SEG
005432 006550          KKI5: MFPI      @-(R10) ;-(KSP)+VIRT+4
005434 005037 177572          CLR      @@SRO        ;DISABLE SEG
005440 005216          INC      (KSP)        ;CHECK RESULT
005442 001401          BEQ      .+4
005444 000000          HLT
005446 005067 172324          CLR      PSW
005452 104000          SCOPE

;DM=6
005454 012767 004000 172314  MOV      @REG,PSW     ;KERNEL MODE!!!,PREV KERNEL MODE!!
005462 012766 177777 177776  MOV      @-1,-2(KSP)
005470 012702 000002          MOV      @2,R12      ;LOAD INDEX REGISTER
005474 005037 016602          CLR      @@PHYS+2    ;PRESET PHYSICAL ADDRESS DATA
005500 005237 177572          INC      @@SRO        ;ENABLE SEG
005504 006562 016600          KKI6: MFPI      VIRT(R12) ;-(KSP)+VIRT-2
005510 005037 177572          CLR      @@SRO        ;DISABLE SEG
005514 022706 001056          CMP      @KPTR-2,KSP ;CHECK STACK PTR
005520 001401          BEQ      .+4
005522 000000          HLT                  ;ERROR! INCORRECT STACK PTR
005524 005716          TST      (KSP)        ;CHECK RESULT
005526 001401          BEQ      .+4
005530 000000          HLT                  ;ERROR! INCORRECT RESULT
005532 005067 172240          CLR      PSW
005536 104000          SCOPE

;DM=7
005540 005067 172232          CLR      PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
005544 005066 177776          CLR      -2(KSP)
005550 012702 177774          MOV      @-4,R2      ;LOAD INDEX REGISTER
005554 012737 016600 001004  MOV      @VIRT,@TEMP  ;LOAD ADDRESS
005562 012737 177777 016600  MOV      @-1,@@PHYS  ;CLEAR PHYSICAL ADDRESS DATA
005570 005237 177572          INC      @@SRO        ;ENABLE SEG

```


005574 006572 001010
005600 005037 177572
005604 005216
005606 001401
005610 000000
005612 104000

KKI7: MFPI @TEMP+4(R2) ;-(KSP)+VIRT
CLR @#SRO ;DISABLE SEG
INC (KSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC

005614 005067 172156
005620 012706 001060
005624 005066 177776
005630 005237 177572
005634 000277
005636 006507
005640 016702 172132
005644 005037 177572
005650 122702 000001
005654 001401
005656 000000
005660 022706 001056
005664 001401
005666 000000
005670 022716 005640
005674 001401
005676 000000
005700 104000

CLR PSH ;KERNEL MODE!!! PREV KERNEL MODE!!
MOV @KPTR,KSP ;SET KERNEL STACK PTR
CLR -2(KSP)
INC @#SRO ;ENABLE SEG
SCC
KKI10: MFPI PC ;-(KSP)+PC
MOV PSH,R2 ;SAVE CC'S
CLR @#SRO ;DISABLE SEG
CMPB @C,R2 ;CHECK CC'S
BEQ .+4
HLT
CMP @KPTR-2,KSP ;CHECK STACK PTR
BEQ .+4
HLT ;ERROR! STACK NOT PUSHED
CMP @KKI10+2,(KSP) ;CHECK THAT PS WAS PUSHED ON THE STACK
BEQ .+4
HLT ;ERROR! PC NOT PUSHED ON THE STACK
SCOPE

005702 012767 004000 172066
005710 005066 177776
005714 012737 177777 016600
005722 005237 177572
005726 006537 016600
005732 005037 177572
005736 005216
005740 001401
005742 000000
005744 104000

;DM=3,PC
MOV @REG,PSH ;KERNEL MODE!!!,PREV KERNEL MODE!!
CLR -2(KSP)
MOV @-1,@#PHYS
INC @#SRO ;ENABLE SEG
KKI11: MFPI @#VIRT ;-(KSP)+VIRT
CLR @#SRO ;DISABLE SEG
INC (KSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

005746 012767 000340 172022
005754 012766 177777 177776
005762 005037 016600
005766 005237 177572
005772 006567 010602
005776 005037 177572
006002 005716
006004 001401
006006 000000
006010 104000

;DM=6,PC
MOV @PTY7,PSH ;KERNEL MODE!!!,PREV KERNEL MODE!!
MOV @-1,-2(KSP)
CLR @#PHYS ;PRESET PHYSICAL ADDRESS DATA
INC @#SRO ;ENABLE SEG
KKI12: MFPI VIRT ;-(KSP)+VIRT
CLR @#SRO ;DISABLE SEG
TST (KSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

006012 005067 171760

;DM=7,PC
CLR PSH ;KERNEL MODE!!!,PREV KERNEL MODE!!

006016	005066	177776		CLR	-2(KSP)	
006022	012737	016604	001004	MOV	@VIRT+4,@TEMP	;LOAD ADDRESS
006030	012737	177777	016604	MOV	@-1,@PHYS+4	;PRESET DATA
006036	005237	177572		INC	@SRO	;ENABLE SEG
006042	000277			SCC		
006044	006577	172734	KKI13:	MFPI	@TEMP	;-(KSP)+VIRT+4
006050	016702	171722		MOV	PSW,R2	;SAVE CC'S
006054	005037	177572		CLR	@SRO	;DISABLE SEG
006060	122702	000011		CMPB	@N+C,R2	;CHECK CC'S
006064	001401			BEQ	+.4	
006066	000000			HLT		;ERROR! INCORRECT CC'S
006070	005216			INC	(KSP)	;CHECK RESULT
006072	001401			BEQ	+.4	
006074	000000			HLT		;ERROR! INCORRECT RESULT ON STACK
006076	104000			SCOPE		
006100	012766	177777	177776	MOV	@-1,-2(KSP)	
006106	005237	177572		INC	@SRO	;ENABLE SEG
006112	006517		KKI14:	MFPI	(PC)	;PUSH NEXT WORD ON THE STACK
006114	000400		KKI14A:	BR	+.2	;THIS DATA GOES ONTO THE STACK
006116	005037	177572		CLR	@SRO	;DISABLE SEG
006122	023716	006114		CMP	@KKI14A,(KSP)	;CHECK DATA ON THE STACK
006126	001401			BEQ	+.4	
006130	000000			HLT		;ERROR! INCORRECT DATA ON STACK
006132	104000			SCOPE		


```

;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS SUPERVISOR MODE
;VIRT=40000 ;SUPER VIRTUAL 'I' ADDRESS FOR THESE TESTS
;PHYS=17000 ;CORRESPONDING SUPER PHYSICAL 'I' ADDRESS

040000
017000

;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R10)
;KERNEL MODE!!!,PREV SUPER MODE!!
006134 012767 014000 171634 MOV #PSM+REG,PSW
006142 012766 177777 177776 MOV #1,-2(KSP)
006150 005000 CLR R10 ;PRESET REGISTER
006152 005237 177572 INC @#SRO ;ENABLE SEG
006156 000277 SCC ;PRESET CC'S
006160 000500 MFPI R10 ;-(KSP)+(R10)
006162 016704 171610 MOV PSM,R14 ;SAVE CC'S
006166 005037 177572 CLR @#SRO ;DISABLE SEG
006172 122704 000005 CMPB #2+C,R14 ;CHECK CC'S
006176 001401 BEQ .+4
006200 000000 HLT ;ERROR! INCORRECT CC'S
006202 022706 001056 CMP #KPTR-2,KSP ;CHECK THAT STACK PTR WAS PUSHED
006206 001401 BEQ .+4
006210 000000 HLT ;ERROR! INCORRECT STACK PTR
006212 005716 TST (KSP) ;CHECK RESULT
006214 001401 BEQ .+4
006216 000000 HLT ;ERROR! INCORRECT RESULT
006220 005067 171552 CLR PSM
006224 104000 SCOPE

;TEST THAT MFPI CAN GET DATA FROM A SUPERVISOR VIRTUAL 'I' ADDRESS
;DM=1
006226 012767 010000 171542 MOV #KM+PSM,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
006234 005066 177776 CLR -2(KSP)
006240 012702 040000 MOV #VIRT,R2 ;R2=VIRTUAL ADDRESS
006244 012737 177777 017000 MOV #1,@#PHYS ;PRESET PHYSICAL ADDRESS
006252 005237 177572 INC @#SRO ;ENABLE SEG
006256 000277 SCC ;PRESET CC'S
006260 006512 MFPI (R2) ;-(KSP)+(R2)
006262 016703 171510 MOV PSM,R3 ;SAVE CC'S
006266 005037 177572 CLR @#SRO ;DISABLE SEG
006272 122703 000011 CMPB #N+C,R3 ;CHECK CC'S
006276 001401 BEQ .+4
006300 000000 HLT ;ERROR! INCORRECT CC'S
006302 022706 001056 CMP #KPTR-2,KSP ;CHECK THAT STACK WAS PUSHED
006306 001401 BEQ .+4
006310 000000 HLT ;ERROR! INCORRECT STACK PTR
006312 005216 INC (KSP) ;CHECK RESULT
006314 001401 BEQ .+4
006316 000000 HLT ;ERROR! INCORRECT RESULT
006320 104000 SCOPE

;DM=2
006322 012767 014000 171446 MOV #PSM+REG,PSW ;KERNEL MODE!!!,PREV SUPER MODE!!
006330 012766 177777 177776 MOV #1,-2(KSP)
006336 012702 040000 MOV #VIRT,R12 ;R12=VIRTUAL ADDRESS
006342 005037 017000 CLR @#PHYS ;PRESET PHYSICAL ADDRESS
006346 005237 177572 INC @#SRO ;ENABLE SEG
006352 006522 MFPI (R12)+ ;-(KSP)+VIRT

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006354	005037	177572		CLR	@#SRO	;DISABLE SEG
006360	005716			TST	(KSP)	;CHECK RESULT
006362	001401			BEQ	+.4	
006364	000000			HLT		;ERROR! INCORRECT RESULT ON STACK
006366	022702	040002		CMP	@VIRT+2,R12	;CHECK AUTO INCREMENT
006372	001401			BEQ	+.4	
006374	000000			HLT		;ERROR! AUTO INCREMENT FAILED
006376	005067	171374		CLR	PSW	
006402	104000			SCOPE		
;DM=3						
006404	012767	010000	171364	MOV	@KM+PSM,PSW	;KERNEL MODE!!!,PREV SUPER MODE!!
006412	005066	177776		CLR	-2(KSP)	
006416	012702	001004		MOV	@TEMP,R2	;LOAD INDIRECT ADDRESS
006422	012737	040002	001004	MOV	@VIRT+2,@TEMP	;LOAD ADDRESS
006430	012737	177777	017002	MOV	@-1,@PHYS+2	;PRESET DATA
006436	005237	177572		INC	@#SRO	;ENABLE SEG
006442	006532			MFPI	@(R2)+	;-(KSP)+VIRT+2
006444	005037	177572		CLR	@#SRO	;DISABLE SEG
006450	005216			INC	(KSP)	;CHECK RESULT
006452	001401			BEQ	+.4	
006454	000000			HLT		;ERROR! INCORRECT RESULT
006456	104000			SCOPE		
;DM=4						
006460	012767	010000	171310	MOV	@KM+PSM,PSW	;KERNEL MODE!!!,PREV SUPER MODE!!
006466	012766	177777	177776	MOV	@-1,-2(KSP)	
006474	012704	040002		MOV	@VIRT+2,R4	;R4=VIRTUAL ADDRESS+2
006500	005037	017000		CLR	@#PHYS	;PRESET PHYSICAL ADDRESS DATA
006504	005237	177572		INC	@#SRO	;ENABLE SEG
006510	006544			MFPI	-(R4)	;-(KSP)+VIRT
006512	005037	177572		CLR	@#SRO	;DISABLE SEG
006516	022704	040000		CMP	@VIRT,R4	;CHECK AUTO-DECREMENT
006522	001401			BEQ	+.4	
006524	000000			HLT		;ERROR! AUTO-DECREMENT FAILED
006526	005716			TST	(KSP)	;CHECK RESULT
006530	001401			BEQ	+.4	
006532	000000			HLT		;ERROR! INCORRECT RESULT
006534	104000			SCOPE		
;DM=5						
006536	012767	014000	171232	MOV	@PSM+REG,PSW	;KERNEL MODE!!!,PREV SUPER MODE!!
006544	005066	177776		CLR	-2(KSP)	
006550	012700	001006		MOV	@TEMP+2,R10	;R10=INDIRECT ADDRESS
006554	012737	040004	001004	MOV	@VIRT+4,@TEMP	;LOAD ADDRESS
006562	012737	177777	017004	MOV	@-1,@PHYS+4	;PRESET PHYSICAL ADDRESS DATA
006570	005237	177572		INC	@#SRO	;ENABLE SEG
006574	006550			MFPI	@-(R10)	;-(KSP)+VIRT+4
006576	005037	177572		CLR	@#SRO	;DISABLE SEG
006602	005216			INC	(KSP)	;CHECK RESULT
006604	001401			BEQ	+.4	
006606	000000			HLT		
006610	005067	171162		CLR	PSW	
006614	104000			SCOPE		

;DM=6


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006616 012767 014000 171152      MOV      #PSM+REG,PSW      ;KERNEL MODE!!!,PREV SUPER MODE!!
006624 012766 177777 177776      MOV      #-1,-2(KSP)
006632 012702 000002      MOV      #2,R12           ;LOAD INDEX REGISTER
006636 005037 017002      CLR      @#PHYS+2         ;PRESET PHYSICAL ADDRESS DATA
006642 005237 177572      INC      @#SRO            ;ENABLE SEG
006646 006562 040000      KSI6:  MFPI  VIRT(R12)     ;-(KSP)+VIRT-2
006652 005037 177572      CLR      @#SRO            ;DISABLE SEG
006656 022706 001056      CMP      #KPTR-2,KSP     ;CHECK STACK PTR
006662 001401      BEQ      .+4
006664 000000      HLT
006666 005716      TST      (KSP)           ;ERROR! INCORRECT STACK PTR
006670 001401      BEQ      .+4             ;CHECK RESULT
006672 000000      HLT
006674 005067 171076      CLR      PSM
006700 104000      SCOPE

;DM=7
006702 012767 010000 171066      MOV      #KM+PSM,PSW     ;KERNEL MODE!!!,PREV SUPER MODE!!
006710 005066 177776      CLR      -2(KSP)
006714 012702 177774      MOV      #-4,R2
006720 012737 040000 001004      MOV      @VIRT,@#TEMP    ;LOAD INDEX REGISTER
006726 012737 177777 017000      MOV      #-1,@#PHYS     ;LOAD ADDRESS
006734 005237 177572      INC      @#SRO            ;CLEAR PHYSICAL ADDRESS DATA
                                ;ENABLE SEG
006740 006572 001010      KSI7:  MFPI  @TEMP+4(R2)  ;-(KSP)+VIRT
006744 005037 177572      CLR      @#SRO            ;DISABLE SEG
006750 005216      INC      (KSP)           ;CHECK RESULT
006752 001401      BEQ      .+4
006754 000000      HLT
006756 104000      SCOPE

;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
006760 012767 010000 171010      MOV      #KM+PSM,PSW     ;KERNEL MODE!!!,PREV SUPER MODE!!
006766 005066 177776      CLR      -2(KSP)
006772 005237 177572      INC      @#SRO            ;ENABLE SEG
006776 000277      SCC
007000 006507      KSI10: MFPI  PC           ;-(KSP)+PC
007002 016702 170770      MOV      PSM,R2          ;SAVE CC'S
007006 005037 177572      CLR      @#SRO            ;DISABLE SEG
007012 122702 000001      CMPB    #C,R2           ;CHECK CC'S
007016 001401      BEQ      .+4
007020 000000      HLT
007022 022706 001056      CMP      #KPTR-2,KSP     ;CHECK STACK PTR
007026 001401      BEQ      .+4
007030 000000      HLT
007032 022716 007002      CMP      #KSI10+2,(KSP)  ;ERROR! STACK NOT PUSHED
007036 001401      BEQ      .+4             ;CHECK THAT PC WAS PUSHED ON THE STACK
007040 000000      HLT
007042 104000      SCOPE

;DM=3,PC
007044 012767 014000 170724      MOV      #PSM+REG,PSW     ;KERNEL MODE!!!,PREV SUPER MODE!!
007052 005066 177776      CLR      -2(KSP)

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007056 012737 177777 017000      MOV      @-1,@PHYS
007064 005237 177572      INC      @SRO      ;ENABLE SEG
007070 006537 040000      KSI11: MFPI    @VIRT  ;-(KSP)+VIRT
007074 005037 177572      CLR      @SRO      ;DISABLE SEG
007100 005216      INC      (KSP)     ;CHECK RESULT
007102 001401      BEQ     .+4
007104 000000      HLT
007106 104000      SCOPE      ;ERROR! INCORRECT RESULT

;DM=6,PC
007110 012767 010340 170660      MOV      @PSM+PRTY7,PSW ;KERNEL MODE!!!, PREV SUPER MODE!!
007116 012766 177777 177776      MOV      @-1,-2(KSP)
007124 005037 017000      CLR      @PHYS     ;PRESET PHYSICAL ADDRESS DATA
007130 005237 177572      INC      @SRO      ;ENABLE SEG
007134 006567 030640      KSI12: MFPI    VIRT  ;-(KSP)+VIRT
007140 005037 177572      CLR      @SRO      ;DISABLE SEG
007144 005716      TST     (KSP)     ;CHECK RESULT
007146 001401      BEQ     .+4
007150 000000      HLT
007152 104000      SCOPE      ;ERROR! INCORRECT RESULT

;DM=7,PC
007154 012767 010000 170614      MOV      @KM+PSM,PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007162 005066 177776      CLR      -2(KSP)
007166 012737 040004 001004      MOV      @VIRT+4,@TEMP ;LOAD ADDRESS
007174 012737 177777 017004      MOV      @-1,@PHYS+4 ;PRESET DATA
007202 005237 177572      INC      @SRO      ;ENABLE SEG
007206 000277      SCC
007210 006577 171570      KSI13: MFPI    @TEMP  ;-(KSP)+VIRT+4
007214 016702 170556      MOV      PSM,R2    ;SAVE CC'S
007220 005037 177572      CLR      @SRO      ;DISABLE SEG
007224 122702 000011      CMPB   @N+C,R2    ;CHECK CC'S
007230 001401      BEQ     .+4
007232 000000      HLT
007234 005216      INC     (KSP)     ;ERROR! INCORRECT CC'S
007236 001401      BEQ     .+4      ;CHECK RESULT
007240 000000      HLT
007242 104000      SCOPE      ;ERROR! INCORRECT RESULT ON STACK

007244 012767 010000 170524      MOV      @KM+PSM,PSW  ;KERNEL MODE!!!,PREV SUPER MODE!!
007252 012716 040000      MOV      @VIRT,(KSP)
007256 005037 017000      CLR      @PHYS     ;ENABLE SEG
007262 005237 177572      INC      @SRO      ;-(KSP)+VIRT
007266 006536      KSI14: MFPI    @SRO  ;DISABLE SEG
007270 005037 177572      CLR      @SRO      ;CHECK DATA ON THE STACK
007274 005737 001060      TST     @@KPTR
007300 001401      BEQ     .+4
007302 000000      HLT
007304 104000      SCOPE      ;ERROR! INCORRECT DATA ON THE STACK

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120000
017200

```

;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS USER MODE
VIRT=120000 ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
PHYS=17200  ;CORRESPONDING USER PHYSICAL 'I' ADDRESS

;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R10).

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007306 012767 034000 170462      MOV      #PUM+REG,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
007314 012766 177777 177776      MOV      #-1,-2(KSP)
007322 005000                      CLR      R10              ;PRESET REGISTER
007324 005237 177572              INC      @#SRO            ;ENABLE SEG
007330 000277                      SCC
007332 006500                      MFPI    R10              ;PRESET CC'S
007334 016704 170436      MOV      PSM,R14         ;-(KSP)+(R10)
007340 005037 177572      CLR      @#SRO            ;SAVE CC'S
007344 122704 000005      CMPB    #Z+C,R14        ;DISABLE SEG
007350 001401                      BEQ     .+4              ;CHECK CC'S
007352 000000                      HLT
007354 022706 001056      CMP      #KPTR-2,KSP    ;ERROR! INCORRECT CC'S
007360 001401                      BEQ     .+4              ;CHECK THAT STACK PTR WAS PUSHED
007362 000000                      HLT
007364 005716                      TST     (KSP)           ;ERROR! INCORRECT STACK PTR
007366 001401                      BEQ     .+4              ;CHECK RESULT
007370 000000                      HLT
007372 005067 170400      CLR      PSW            ;ERROR! INCORRECT RESULT
007376 104000                      SCOPE

```

;TEST THAT MFPI CAN GET DATA FROM A KERNEL VIRTUAL 'I' ADDRESS
;DM=1

```

007400 012767 030000 170370      MOV      #KM+PUM,PSW    ;KERNEL MODE!!!,PREV USER MODE!!
007406 005066 177776      CLR      -2(KSP)
007412 012702 120000      MOV      #VIRT,R2       ;R2=VIRTUAL ADDRESS
007416 012737 177777 017200      MOV      #-1,@#PHYS     ;PRESET PHYSICAL ADDRESS
007424 005237 177572              INC      @#SRO            ;ENABLE SEG
007430 000277                      SCC
007432 006512                      MFPI    (R2)            ;PRESET CC'S
007434 016703 170336      MOV      PSM,R3         ;-(KSP)+(R2)
007440 005037 177572      CLR      @#SRO            ;SAVE CC'S
007444 122703 000011      CMPB    #N+C,R3        ;DISABLE SEG
007450 001401                      BEQ     .+4              ;CHECK CC'S
007452 000000                      HLT
007454 022706 001056      CMP      #KPTR-2,KSP    ;ERROR! INCORRECT CC'S
007460 001401                      BEQ     .+4              ;CHECK THAT STACK WAS PUSHED
007462 000000                      HLT
007464 005216                      INC     (KSP)           ;ERROR! INCORRECT STACK PTR
007466 001401                      BEQ     .+4              ;CHECK RESULT
007470 000000                      HLT
007472 104000                      SCOPE

```

;DM=2

```

007474 012767 034000 170274      MOV      #PUM+REG,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
007502 012766 177777 177776      MOV      #-1,-2(KSP)
007510 012702 120000      MOV      #VIRT,R12     ;R12=VIRTUAL ADDRESS
007514 005037 017200      CLR      @#PHYS        ;PRESET PHYSICAL ADDRESS
007520 005237 177572              INC      @#SRO            ;ENABLE SEG
007524 006522                      MFPI    (R12)+         ;-(KSP)+VIRT
007526 005037 177572      CLR      @#SRO            ;DISABLE SEG
007532 005716                      TST     (KSP)           ;CHECK RESULT
007534 001401                      BEQ     .+4
007536 000000                      HLT
007540 022702 120002      CMP      #VIRT+2,R12   ;ERROR! INCORRECT RESULT ON STACK
007544 001401                      BEQ     .+4              ;CHECK AUTO INCREMENT
007546 000000                      HLT

```

;ERROR! AUTO INCREMENT FAILED

K03

007550	005067	170222		CLR	PSW	
007554	104000			SCOPE		
;DM=3						
007556	012767	030000	170212	MOV	#KM+PUM,PSW	;KERNEL MODE!!!,PREV USER MODE!!
007564	005066	177776		CLR	-2(KSP)	
007570	012702	001004		MOV	#TEMP,R2	;LOAD INDIRECT ADDRESS
007574	012737	120002	001004	MOV	#VIRT+2,#TEMP	;LOAD ADDRESS
007602	012737	177777	017202	MOV	#-1,#PHYS+2	;PRESET DATA
007610	005237	177572		INC	#SRO	;ENABLE SEG
007614	006532			MFPI	#(R2)+	;-(KSP)+VIRT+2
007616	005037	177572		CLR	#SRO	;DISABLE SEG
007622	005216			INC	(KSP)	;CHECK RESULT
007624	001401			BEQ	.+4	
007626	000000			HLT		;ERROR! INCORRECT RESULT
007630	104000			SCOPE		
;DM=4						
007632	012767	030000	170136	MOV	#KM+PUM,PSW	;KERNEL MODE!!!,PREV USER MODE!!
007640	012766	177777	177776	MOV	#-1,-2(KSP)	
007646	012704	120002		MOV	#VIRT+2,R4	;R4=VIRTUAL ADDRESS+2
007652	005037	017200		CLR	#PHYS	;PRESET PHYSICAL ADDRESS DATA
007656	005237	177572		INC	#SRO	;ENABLE SEG
007662	006544			MFPI	-(R4)	;-(KSP)+VIRT
007664	005037	177572		CLR	#SRO	;DISABLE SEG
007670	022704	120000		CMP	#VIRT,R4	;CHECK AUTO-DECREMENT
007674	001401			BEQ	.+4	
007676	000000			HLT		;ERROR! AUTO-DECREMENT FAILED
007700	005716			TST	(KSP)	;CHECK RESULT
007702	001401			BEQ	.+4	
007704	000000			HLT		;ERROR! INCORRECT RESULT
007706	104000			SCOPE		
;DM=5						
007710	012767	034000	170060	MOV	#PUM+REG,PSW	;KERNEL MODE!!!,PREV USER MODE!!
007716	005066	177776		CLR	-2(KSP)	
007722	012700	001006		MOV	#TEMP+2,R10	;R10=INDIRECT ADDRESS
007726	012737	120004	001004	MOV	#VIRT+4,#TEMP	;LOAD ADDRESS
007734	012737	177777	017204	MOV	#-1,#PHYS+4	;PRESET PHYSICAL ADDRESS DATA
007742	005237	177572		INC	#SRO	;ENABLE SEG
007746	006550			MFPI	#(R10)	;-(KSP)+VIRT+4
007750	005037	177572		CLR	#SRO	;DISABLE SEG
007754	005216			INC	(KSP)	;CHECK RESULT
007756	001401			BEQ	.+4	
007760	000000			HLT		
007762	005067	170010		CLR	PSW	
007766	104000			SCOPE		
;DM=6						
007770	012767	034000	170000	MOV	#PUM+REG,PSW	;KERNEL MODE!!!,PREV USER MODE!!
007776	012766	177777	177776	MOV	#-1,-2(KSP)	
010004	012702	000002		MOV	#2,R12	;LOAD INDEX REGISTER
010010	005037	017202		CLR	#PHYS+2	;PRESET PHYSICAL ADDRESS DATA
010014	005237	177572		INC	#SRO	;ENABLE SEG
010020	006562	120000		MFPI	VIRT(R12)	;-(KSP)+VIRT-2
010024	005037	177572		CLR	#SRO	;DISABLE SEG


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010030 022706 001056      CMP      #KPTR-2,KSP      ;CHECK STACK PTR
010034 001401              BEQ      .+4
010036 000000              HLT
010040 005716              TST      (KSP)          ;ERROR! INCORRECT STACK PTR
010042 001401              BEQ      .+4          ;CHECK RESULT
010044 000000              HLT
010046 005067 167724      CLR      PSW          ;ERROR! INCORRECT RESULT
010052 104000              SCOPE

;DM=7
010054 012767 030000 167714  ;DM=7      MOV      #KM+PUM,PSW    ;KERNEL MODE!!!,PREV USER MODE!!
010062 005066 177776              CLR      -2(KSP)
010066 012702 177774              MOV      #-4,R2        ;LOAD INDEX REGISTER
010072 012737 120000 001004  ;DM=7      MOV      @VIRT,@TEMP    ;LOAD ADDRESS
010100 012737 177777 017200  ;DM=7      MOV      #-1,@PHYS     ;CLEAR PHYSICAL ADDRESS DATA
010106 005237 177572              INC      @SRO          ;ENABLE SEG
010112 006572 001010  KUI7:      MFPI     @TEMP+4(R2)    ;-(KSP)+VIRT
010116 005037 177572              CLR      @SRO          ;DISABLE SEG
010122 005216              INC      (KSP)         ;CHECK RESULT
010124 001401              BEQ      .+4
010126 000000              HLT
010130 104000              SCOPE          ;ERROR! INCORRECT RESULT

;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
010132 012767 030000 167636  ;DM=0,PC  MOV      #KM+PUM,PSW    ;KERNEL MODE!!!,PREV USER MODE!!
010140 005066 177776              CLR      -2(KSP)
010144 005237 177572              INC      @SRO          ;ENABLE SEG
010150 000277              SCC
010152 006507              MFPI     PC            ;-(KSP)+PC
010154 016702 167616  KUI10:    MOV      PSW,R2        ;SAVE CC'S
010160 005037 177572              CLR      @SRO          ;DISABLE SEG
010164 122702 000001              CMPB    #C,R2         ;CHECK CC'S
010170 001401              BEQ      .+4
010172 000000              HLT
010174 022706 001056      CMP      #KPTR-2,KSP    ;CHECK STACK PTR
010200 001401              BEQ      .+4
010202 000000              HLT
010204 022716 010154      CMP      #KUI10+2,(KSP) ;ERROR! STACK NOT PUSHED
010210 001401              BEQ      .+4          ;CHECK THAT PC WAS PUSHED ON THE STACK
010212 000000              HLT
010214 104000              SCOPE          ;ERROR! PC NOT PUSHED ON THE STACK

;DM=3,PC
010216 012767 034000 167552  ;DM=3,PC  MOV      #PUM+REG,PSW   ;KERNEL MODE!!!,PREV USER MODE!!
010224 005066 177776              CLR      -2(KSP)
010230 012737 177777 017200  ;DM=3,PC  MOV      #-1,@PHYS     ;ENABLE SEG
010236 005237 177572              INC      @SRO
010242 006537 120000  KUI11:    MFPI     @VIRT        ;-(KSP)+VIRT
010246 005037 177572              CLR      @SRO          ;DISABLE SEG
010252 005216              INC      (KSP)         ;CHECK RESULT
010254 001401              BEQ      .+4
010256 000000              HLT
010260 104000              SCOPE          ;ERROR! INCORRECT RESULT

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;DM=6,PC

010262	012767	030340	167506	MOV	#PUM+PRTY7,PSW	;KERNEL MODE!!!, PREV USER MODE!!
010270	012766	177777	177776	MOV	#-1,-2(KSP)	
010276	005037	017200		CLR	@#PHYS	;PRESET PHYSICAL ADDRESS DATA
010302	005237	177572		INC	@#SRO	;ENABLE SEG
010306	006567	107466	KUI12:	MFPI	VIRT	;- (KSP)+VIRT
010312	005037	177572		CLR	@#SRO	;DISABLE SEG
010316	005716			TST	(KSP)	;CHECK RESULT
010320	001401			BEQ	.+4	
010322	000000			HLT		;ERROR! INCORRECT RESULT
010324	104000			SCOPE		
;DM=7,PC						
010326	012767	030000	167442	MOV	#KM+PUM,PSW	;KERNEL MODE!!!,PREV USER MODE!!
010334	005066	177776		CLR	-2(KSP)	
010340	012737	120004	001004	MOV	#VIRT+4,@#TEMP	;LOAD ADDRESS
010346	012737	177777	017204	MOV	#-1,@#PHYS+4	;PRESET DATA
010354	005237	177572		INC	@#SRO	;ENABLE SEG
010360	000277			SCC		
010362	006577	170416	KUI13:	MFPI	@TEMP	;- (KSP)+VIRT+4
010366	016702	167404		MOV	PSW,R2	;SAVE CC'S
010372	005037	177572		CLR	@#SRO	;DISABLE SEG
010376	122702	000011		CMPB	#N+C,R2	;CHECK CC'S
010402	001401			BEQ	.+4	
010404	000000			HLT		;ERROR! INCORRECT CC'S
010406	005216			INC	(KSP)	;CHECK RESULT
010410	001401			BEQ	.+4	
010412	000000			HLT		;ERROR! INCORRECT RESULT ON STACK
010414	104000			SCOPE		
010416	012767	030000	167352	MOV	#KM+PUM,PSW	;KERNEL MODE!!!,PREV USER MODE!!
010424	012716	120000		MOV	#VIRT,(KSP)	
010430	005037	017200		CLR	@#PHYS	
010434	005237	177572		INC	@#SRO	;ENABLE SEG
010440	006576	000000	KUI14:	MFPI	@(KSP)	;- (KSP)+VIRT
010444	005037	177572		CLR	@#SRO	;DISABLE SEG
010450	005737	001056		TST	@#KPTR-2	;CHECK DATA ON THE STACK
010454	001401			BEQ	.+4	
010456	000000			HLT		;ERROR! INCORRECT DATA ON THE STACK
010460	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 0700

```

```

;START TESTS IN SUPERVISORY MODE
;LOAD SUPERVISORY MEM MGMT REGISTERS AS REQUIRED FOR TESTS.

```

```

010462 012737 041416 172200      MOV      #104*256.-400+DWN+RW,2#SIPDR0 ;LOAD SIPDR0 RW DWN 104 BLOCKS
010470 012737 004006 172220      MOV      #11*256.-400+UP+RW,2#SDPDR0   ;LOAD SDPDR0 RW UP 11 BLOCKS
010476 012737 077406 172236      MOV      #200*256.-400+UP+RW,2#SDPDR7  ;LOAD SDPDR7 RW UP 200 BLOCKS
010504 012767 007600 161564      MOV      #7600,SDPAR7 ;I/O PAGE

```

```

;TEST MFPD INSTRUCTION SUPER MODE PREVIOUS SUPER MODE.
VIRT=20000 ;SUPER VIRTUAL 'D' ADDRESS FOR THESE TESTS
PHYS=17100 ;CORRESPONDING SUPER PHYSICAL 'D' ADDRESS

```

```

010512 012737 050340 177776      MOV      #SM+PSM+PRTY7,2#PSW ;SUPER MODE!!! PREV SUPER MODE!!
010520 005066 177776      CLR      -2(SSP)
010524 012703 177777      MOV      #-1,R3 ;PRESET GENERAL REGISTER
010530 005237 177572      INC      2#SRO ;ENABLE SEG
010534 106503 177572      MFPD    R3 ;-(SSP)+R3
010536 016702 167234      MOV      PSW,R2 ;SAVE CC'S
010542 005037 177572      CLR      2#SRO ;DISABLE SEG
010546 122702 000350      CMPB    #PRTY7+N,R2 ;CHECK CC'S
010552 001401 .+4
010554 000000      HLT
010556 022706 000676      CMP      #SPTR-2,SSP ;ERROR! INCORRECT CC'S AFTER MFPD
010562 001401 .+4 ;CHECK THAT STACK WAS PUSHED
010564 000000      HLT ;ERROR! INCORRECT STACK PTR
010566 005216      INC      (KSP) ;CHECK RESULT
010570 001401 .+4
010572 000000      HLT ;ERROR! INCORRECT RESULT
010574 104000      SCOPE

```

;DM=2

```

010576 012767 054000 167172      MOV      #SM+PSM+REG,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
010604 012766 177777 177776      MOV      #-1,-2(SSP)
010612 012702 020000      MOV      #VIRT,R12 ;R12=VIRTUAL ADDRESS
010616 005037 017100      CLR      2#PHYS ;PRESET PHYSICAL ADDRESS
010622 005237 177572      INC      2#SRO ;ENABLE SEG
010626 106522 177572      MFPD    (R12)+ ;-(SSP)+VIRT
010630 005037 177572      CLR      2#SRO ;DISABLE SEG
010634 005716      TST      (SSP) ;CHECK RESULT
010636 001401 .+4
010640 000000      HLT ;ERROR! INCORRECT RESULT ON STACK
010642 022702 020002      CMP      #VIRT+2,R12 ;CHECK AUTO INCREMENT
010646 001401 .+4
010650 000000      HLT ;ERROR! AUTO INCREMENT FAILED
010652 005067 167120      CLR      PSW
010656 104000      SCOPE

```

;DM=4

```

010660 012767 050000 167110      MOV      #SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
010666 012766 177777 177776      MOV      #-1,-2(SSP)
010674 012704 020002      MOV      #VIRT+2,R4 ;R4=VIRTUAL ADDRESS+2

```



```

010700 005037 017100          CLR      @PHYS      ;PRESET PHYSICAL ADDRESS DATA
010704 005237 177572          INC      @SRO       ;ENABLE SEG
010710 106544          MFPD    -(R4)      ;-(SSP)+VIRT
010712 005037 177572          CLR      @SRO       ;DISABLE SEG
010716 022704 020000          CMP     @VIRT,R4  ;CHECK AUTO-DECREMENT
010722 001401          BEQ     .+4
010724 000000          HLT
010726 005716          TST     (SSP)     ;ERROR! AUTO-DECREMENT FAILED
010730 001401          BEQ     .+4      ;CHECK RESULT
010732 000000          HLT
010734 104000          SCOPE          ;ERROR! INCORRECT RESULT
    
```

```

;DM=6
010736 012767 054000 167032  MOV     @SM+PSM+REG,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
010744 012766 177777 177776  MOV     @-1,-2(SSP)
010752 012702 000002          MOV     @2,R12      ;LOAD INDEX REGISTER
010756 005037 017102          CLR     @PHYS+2    ;PRESET PHYSICAL ADDRESS DATA
010762 005237 177572          INC     @SRO       ;ENABLE SEG
010766 106562 020000          MFPD   VIRT(R12)   ;-(SSP)+VIRT-2
010772 005037 177572          CLR     @SRO       ;DISABLE SEG
010776 022706 000676          CMP     @SPTR-2,SSP ;CHECK STACK PTR
011002 001401          BEQ     .+4
011004 000000          HLT          ;ERROR! INCORRECT STACK PTR
011006 005716          TST     (SSP)     ;CHECK RESULT
011010 001401          BEQ     .+4
011012 000000          HLT          ;ERROR! INCORRECT RESULT
011014 005067 166756          CLR     PSM
011020 104000          SCOPE
    
```

```

;TEST THAT MFPD OPERATES PROPERLY USING PC IN DESTINATION
;DM=3,PC
011022 012767 054000 166746  MOV     @SM+PSM+REG,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
011030 005066 177776          CLR     -2(SSP)
011034 012737 177777 017100  MOV     @-1,@PHYS
011042 005237 177572          INC     @SRO       ;ENABLE SEG
011046 106537 020000          MFPD   @VIRT      ;-(SSP)+VIRT
011052 005037 177572          CLR     @SRO       ;DISABLE SEG
011056 005216          INC     (SSP)     ;CHECK RESULT
011060 001401          BEQ     .+4
011062 000000          HLT          ;ERROR! INCORRECT RESULT
011064 104000          SCOPE
    
```

```

;DM=6,PC
011066 012737 050340 177776  MOV     @SM+PSM+PRTY7,@PSW ;SUPER MODE!!! PREV SUPER MODE!!
011074 012766 177777 177776  MOV     @-1,-2(SSP)
011102 005037 017100          CLR     @PHYS     ;PRESET PHYSICAL ADDRESS DATA
011106 005237 177572          INC     @SRO       ;ENABLE SEG
011112 106567 006662          MFPD   VIRT      ;-(SSP)+VIRT
011116 005037 177572          CLR     @SRO       ;DISABLE SEG
011122 005716          TST     (SSP)     ;CHECK RESULT
011124 001401          BEQ     .+4
011126 000000          HLT          ;ERROR! INCORRECT RESULT
011130 104000          SCOPE
    
```

```

;DM=7,PC
011132 012767 050000 166636  MOV     @SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
    
```


011140	005066	177776		CLR	-2(SSP)	
011144	012737	020004	017102	MOV	@VIRT+4, @PHYS+2	;LOAD ADDRESS
011152	012737	177777	017104	MOV	@-1, @PHYS+4	;PRESET DATA
011160	005237	177572		INC	@SR0	;ENABLE SEG
011164	000277			SCC		
011166	106577	006610	SS13:	MFPD	@VIRT+2	;-(SSP)+VIRT+4
011172	016702	166600		MOV	PSW, R2	;SAVE CC'S
011176	005037	177572		CLR	@SR0	;DISABLE SEG
011202	122702	000011		CHPB	@N+C, R2	;CHECK CC'S
011206	001401			BEQ	.+4	
011210	000000			HLT		;ERROR! INCORRECT CC'S
011212	005216			INC	(SSP)	;CHECK RESULT
011214	001401			BEQ	.+4	
011216	000000			HLT		;ERROR! INCORRECT RESULT ON STACK
011220	104000			SCOPE		


```

;TEST MFPD INSTRUCTION SUPER MODE PREVIOUS USER MODE,
;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
;CORRESPONDING USER PHYSICAL ADDRESS
100000
017300
VIRT=100000
PHYS=17300

;TEST THAT MFPD CAN GET DATA FROM A GENERAL REGISTER (R10)
;SUPER MODE!!!,PREV USER MODE!!
011222 012767 074000 166546      MOV      @SM+PUM+REG,PSW
011230 012766 177777 177776      MOV      @-1,-2(SSP)
011236 005000                CLR      R10                ;PRESET REGISTER
011240 005237 177572                INC      @@SRO              ;ENABLE SEG
011244 000277                SCC                ;PRESET CC'S
011246 106500                MFPD    R10                ;-(SSP)+(R10)
011250 016704 166522                MOV      PSW,R14           ;SAVE CC'S
011254 005037 177572                CLR      @@SRO            ;DISABLE SEG
011260 122704 000005                CMPB    @Z+C,R14          ;CHECK CC'S
011264 001401                BEQ     .+4
011266 000000                HLT
011270 022706 000676                CMP     @SPTR-2,SSP      ;ERROR! INCORRECT CC'S
011274 001401                BEQ     .+4                ;CHECK THAT STACK PTR WAS PUSHED
011276 000000                HLT                        ;ERROR! INCORRECT STACK PTR
011300 005716                TST     (SSP)            ;CHECK RESULT
011302 001401                BEQ     .+4
011304 000000                HLT                        ;ERROR! INCORRECT RESULT
011306 005067 166464                CLR     PSW
011312 104000                SCOPE

;TEST THAT MFPD CAN GET DATA FROM A USER VIRTUAL 'D' ADDRESS
;DM=1
011314 012767 070000 166454      MOV      @SM+PUM,PSW      ;SUPER MODE!!!,PREV USER MODE!!
011322 005066 177776                CLR     -2(SSP)
011326 012702 100000                MOV     @VIRT,R2          ;R2=VIRTUAL ADDRESS
011332 012737 177777 017300      MOV     @-1,@@PHYS        ;PRESET PHYSICAL ADDRESS
011340 005237 177572                INC     @@SRO            ;ENABLE SEG
011344 000277                SCC                ;PRESET CC'S
011346 106512                MFPD    (R2)              ;-(SSP)+(R2)
011350 016703 166422                MOV     PSW,R3           ;SAVE CC'S
011354 005037 177572                CLR     @@SRO            ;DISABLE SEG
011360 122703 000011                CMPB    @N+C,R3          ;CHECK CC'S
011364 001401                BEQ     .+4
011366 000000                HLT                        ;ERROR! INCORRECT CC'S
011370 022706 000676                CMP     @SPTR-2,SSP      ;CHECK THAT STACK WAS PUSHED
011374 001401                BEQ     .+4
011376 000000                HLT                        ;ERROR! INCORRECT STACK PTR
011400 005216                INC     (SSP)            ;CHECK RESULT
011402 001401                BEQ     .+4
011404 000000                HLT                        ;ERROR! INCORRECT RESULT
011406 104000                SCOPE

;DM=3
011410 012767 070000 166360      MOV      @SM+PUM,PSW      ;SUPER MODE!!!,PREV USER MODE!!
011416 005066 177776                CLR     -2(SSP)
011422 012702 001004                MOV     @TEMP,R2          ;LOAD INDIRECT ADDRESS
011426 012737 100002 001004      MOV     @VIRT+2,@@TEMP    ;LOAD ADDRESS
011434 012737 177777 017302      MOV     @-1,@@PHYS+2      ;PRESET DATA
011442 005237 177572                INC     @@SRO            ;ENABLE SEG
011446 106532                MFPD    @(R2)+           ;-(SSP)+VIRT+2
011450 005037 177572                CLR     @@SRO            ;DISABLE SEG

```



```

011454 005216          INC      (SSP)          ;CHECK RESULT
011456 001401          BEQ      .+4
011460 000000          HLT
011462 104000          SCOPE          ;ERROR! INCORRECT RESULT

;DM=5
011464 012767 074000 166304  MOV      @SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
011472 005066 177776          CLR      -2(SSP)
011476 012700 001006          MOV      @TEMP+2,R10    ;R10=INDIRECT ADDRESS
011502 012737 100004 001004  MOV      @VIRT+4,@TEMP  ;LOAD ADDRESS
011510 012737 177777 017304  MOV      @-1,@PHYS+4    ;PRESET PHYSICAL ADDRESS DATA
011516 005237 177572          INC      @SRO           ;ENABLE SEG
011522 106550          MFPD     @-(R10)        ;-(SSP)+VIRT+4
011524 005037 177572          CLR      @SRO           ;DISABLE SEG
011530 005216          INC      (SSP)          ;CHECK RESULT
011532 001401          BEQ      .+4
011534 000000          HLT
011536 005067 166234          CLR      PSW
011542 104000          SCOPE

;DM=6
011544 012767 074000 166224  MOV      @SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
011552 012766 177777 177776  MOV      @-1,-2(SSP)
011560 012702 000002          MOV      @2,R12        ;LOAD INDEX REGISTER
011564 005037 017302          CLR      @PHYS+2       ;PRESET PHYSICAL ADDRESS DATA
011570 005037 177572          INC      @SRO           ;ENABLE SEG
011574 106362 100000          MFPD     VIRT(R12),    ;-(SSP)+VIRT-2
011600 005037 177572          CLR      @SRO           ;DISABLE SEG
011604 022706 000676          CMP      @SPTR-2,SSP   ;CHECK STACK PTR
011610 001401          BEQ      .+4
011612 000000          HLT
011614 005716          TST      (SSP)          ;ERROR! INCORRECT STACK PTR
011616 001401          BEQ      .+4          ;CHECK RESULT
011620 000000          HLT
011622 005067 166150          CLR      PSW          ;ERROR! INCORRECT RESULT
011626 104000          SCOPE

;DM=7
011630 012767 070000 166140  MOV      @SM+PUM,PSW    ;SUPER MODE!!!,PREV USER MODE!!
011636 005066 177776          CLR      -2(SSP)
011642 012702 177774          MOV      @-4,R2        ;LOAD INDEX REGISTER
011646 012737 100000 001004  MOV      @VIRT,@TEMP    ;LOAD ADDRESS
011654 012737 177777 017300  MOV      @-1,@PHYS     ;CLEAR PHYSICAL ADDRESS DATA
011662 005237 177572          INC      @SRO           ;ENABLE SEG
011666 106572 001010          MFPD     @TEMP+4(R2)   ;-(SSP)+VIRT
011672 005037 177572          CLR      @SRO           ;DISABLE SEG
011676 005216          INC      (SSP)          ;CHECK RESULT
011700 001401          BEQ      .+4
011702 000000          HLT
011704 104000          SCOPE          ;ERROR! INCORRECT RESULT

;TEST THAT MFPD OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
011706 012767 070000 166062  MOV      @SM+PUM,PSW    ;SUPER MODE!!!,PREV USER MODE!!
011714 005066 177776          CLR      -2(SSP)
011720 005237 177572          INC      @SRO           ;ENABLE SEG

```



```

011724 000277
011726 106507
011730 016702 166042
011734 005037 177572
011740 122702 000001
011744 001401
011746 000000
011750 022706 000676
011754 001401
011756 000000
011760 022716 011730
011764 001401
011766 000000
011770 104000

```

SU10: SCC PC ;-(SSP)+PC
MFPD PSM R2 ;SAVE CC'S
MOV @#SRO ;DISABLE SEG
CLR @#R2 ;CHECK CC'S
CMPB .+4
BEQ .+4
HLT
CMP @SPTR-2,SSP ;CHECK STACK PTR
BEQ .+4
HLT ;ERROR! STACK NOT PUSHED
CMP @SU10+2,(SSP) ;CHECK THAT PS WAS PUSHED ON THE STACK
BEQ .+4
HLT ;ERROR! PC NOT PUSHED ON THE STACK
SCOPE

```

011772 012767 074000 165776 ;DM=3,PC
012000 005066 177776
012004 012737 177777 017300
012012 005237 177572
012016 106537 100000
012022 005037 177572
012026 005216
012030 001401
012032 000000
012034 104000

```

SU11: MOV @SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
CLR -2(SSP)
MOV @-1,@#PHYS
INC @#SRO ;ENABLE SEG
MFPD @#VIRT ;-(SSP)+VIRT
CLR @#SRO ;DISABLE SEG
INC (SSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

```

012036 012737 070340 177776 ;DM=6,PC
012044 012766 177777 177776
012052 005037 017300
012056 005237 177572
012062 106567 065712
012066 005037 177572
012072 005716
012074 001401
012076 000000
012100 104000

```

SU12: MOV @SM+PUM+PTY7,@#PSW ;SUPER MODE!!! PREV USER MODE!!
MOV @-1,-2(SSP)
CLR @#PHYS ;PRESET PHYSICAL ADDRESS DATA
INC @#SRO ;ENABLE SEG
MFPD VIRT ;-(SSP)+VIRT
CLR @#SRO ;DISABLE SEG
TST (SSP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

```

012102 012767 070000 165666
012110 012766 177777 177776
012116 012726 100000
012122 005037 017300
012126 005237 177572
012132 106556
012134 005037 177572
012140 005737 000676
012144 001401
012146 000000
012150 104000

```

SU14: MOV @SM+PUM,PSW ;SUPER MODE!!!,PREV USER MODE!!
MOV @-1,-2(SSP) ;PRESET DATA ON STACK
MOV @#VIRT,(SSP)+
CLR @#PHYS
INC @#SRO ;ENABLE SEG
MFPD @-(SSP) ;-(SSP)+VIRT
CLR @#SRO ;DISABLE SEG
TST @#SPTR-2 ;CHECK DATA ON THE STACK
BEQ .+4
HLT ;ERROR! INCORRECT DATA ON THE STACK
SCOPE


```

;TEST MFPI INSTRUCTION SUPER MODE PREVIOUS SUPER MODE.
                                VIRT=40000 ;SUPER VIRTUAL 'I' ADDRESS FOR THESE TESTS
                                PHYS=17000 ;CORRESPONDING SUPER PHYSICAL 'I' ADDRESS
040000
017000
012152 012767 054000 165616      MOV      #SM+PSM+REG,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012160 005066 177776              CLR      -2(SSP)
012164 012703 177777              MOV      @-1,R13 ;PRESET GENERAL REGISTER
012170 005237 177572              INC      @#SRO ;ENABLE SEG
012174 006503                SSIO: MFPI  R13 ;-(SSP)+R13
012176 016702 165574              MOV      PSM,R12 ;SAVE CC'S
012202 005037 177572              CLR      @#SRO ;DISABLE SEG
012206 022702 054010              CMP      #SM+PSM+REG+N,R12 ;CHECK STATUS AFTER MFPI
012212 001401                BEQ      .+4
012214 000000              HLT
012216 022706 000676              CMP      #SPTR-2,SSP ;ERROR! INCORRECT CC'S AFTER MFPI
012222 001401                BEQ      .+4 ;CHECK THAT STACK WAS PUSHED
012224 000000              HLT ;ERROR! INCORRECT STACK PTR
012226 005216              INC      (KSP) ;CHECK RESULT
012230 001401                BEQ      .+4
012232 000000              HLT ;ERROR! INCORRECT RESULT
012234 104000              SCOPE

```

```

;TEST THAT MFPI CAN GET DATA FROM A SUPERVISOR VIRTUAL 'I' ADDRESS
;DM=1
012236 012767 050000 165532      MOV      #SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012244 005066 177776              CLR      -2(SSP)
012250 012702 040000              MOV      #VIRT,R2 ;R2=VIRTUAL ADDRESS
012254 012737 177777 017000      MOV      @-1,@#PHYS ;PRESET PHYSICAL ADDRESS
012262 005237 177572              INC      @#SRO ;ENABLE SEG
012266 000277                SSII: SCC ;PRESET CC'S
012270 006512              MFPI  (R2) ;-(SSP)+(R2)
012272 016703 165500              MOV      PSM,R3 ;SAVE CC'S
012276 005037 177572              CLR      @#SRO ;DISABLE SEG
012302 122703 000011              CMPB   #N+C,R3 ;CHECK CC'S
012306 001401                BEQ      .+4
012310 000000              HLT ;ERROR! INCORRECT CC'S
012312 022706 000676              CMP      #SPTR-2,SSP ;CHECK THAT STACK WAS PUSHED
012316 001401                BEQ      .+4
012320 000000              HLT ;ERROR! INCORRECT STACK PTR
012322 005216              INC      (SSP) ;CHECK RESULT
012324 001401                BEQ      .+4
012326 000000              HLT ;ERROR! INCORRECT RESULT
012330 104000              SCOPE

```

```

;DM=3
012332 012767 050000 165436      MOV      #SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012340 005066 177776              CLR      -2(SSP)
012344 012702 001004              MOV      #TEMP,R2 ;LOAD INDIRECT ADDRESS
012350 012737 040002 001004      MOV      #VIRT+2,@#TEMP ;LOAD ADDRESS
012356 012737 177777 017002      MOV      @-1,@#PHYS+2 ;PRESET DATA
012364 005237 177572              INC      @#SRO ;ENABLE SEG
012370 006532                SSII: MFPI  @(R2)+ ;-(SSP)+VIRT+2
012372 005037 177572              CLR      @#SRO ;DISABLE SEG
012376 005216              INC      (SSP) ;CHECK RESULT
012400 001401                BEQ      .+4
012402 000000              HLT ;ERROR! INCORRECT RESULT

```



```

012404 104000                                SCOPE

;DM=5
012406 012767 054000 165362  MOV    #SM+PSM+REG,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012414 005066 177776          CLR    -2(SSP)
012420 012700 001006          MOV    #TEMP+2,R10    ;R10=INDIRECT ADDRESS
012424 012737 040004 001004  MOV    #VIRT+4,@TEMP  ;LOAD ADDRESS
012432 012737 177777 017004  MOV    #-1,@#PHYS+4   ;PRESET PHYSICAL ADDRESS DATA
012440 005237 177572          INC    @#SRO          ;ENABLE SEG
012444 006550          MFPI   @-(R10)        ;-(SSP)+VIRT+4
012446 005037 177572          CLR    @#SRO          ;DISABLE SEG
012452 005216          INC    (SSP)         ;CHECK RESULT
012454 001401          BEQ    .+4
012456 000000          HLT
012460 005067 165312          CLR    PSM
012464 104000                                SCOPE

;DM=7
012466 012767 050000 165302  MOV    #SM+PSM,PSW    ;SUPER MODE!!!,PREV SUPER MODE!!
012474 005066 177776          CLR    -2(SSP)
012500 012702 177774          MOV    #-4,R2        ;LOAD INDEX REGISTER
012504 012737 040000 001004  MOV    #VIRT,@TEMP    ;LOAD ADDRESS
012512 012737 177777 017000  MOV    #-1,@#PHYS     ;CLEAR PHYSICAL ADDRESS DATA
012520 005237 177572          INC    @#SRO          ;ENABLE SEG
012524 006572 001010  SSI7:  MFPI   @TEMP+4(R2)  ;-(SSP)+VIRT
012530 005037 177572          CLR    @#SRO          ;DISABLE SEG
012534 005216          INC    (SSP)         ;CHECK RESULT
012536 001401          BEQ    .+4
012540 000000          HLT
012542 104000                                SCOPE

;TEST THAT MFPI OPERATES PROPERLY USING PC IN DESTINATION
;DM=0,PC
012544 012767 050000 165224  MOV    #SM+PSM,PSW    ;SUPER MODE!!!,PREV SUPER MODE!!
012552 005066 177776          CLR    -2(SSP)
012556 005237 177572          INC    @#SRO          ;ENABLE SEG
012562 000277          SCC
012564 006507          MFPI   PC            ;-(SSP)+PC
012566 016702 165204  SSI10: MOV    PSM,R2        ;SAVE CC'S
012572 005037 177572          CLR    @#SRO          ;DISABLE SEG
012576 122702 000001  CMPB  #C,R2          ;CHECK CC'S
012602 001401          BEQ    .+4
012604 000000          HLT
012606 022706 000676  CMP    #SPTR-2,SSP    ;CHECK STACK FTR
012612 001401          BEQ    .+4
012614 000000          HLT
012616 022716 012566  CMP    #SSI10+2,(SSP) ;ERROR! STACK NOT PUSHED
012622 001401          BEQ    .+4          ;CHECK THAT PS WAS PUSHED ON THE STACK
012624 000000          HLT
012626 104000                                SCOPE

;DM=6,PC
012630 012737 050340 177776  MOV    #SM+PSM+PRTY7,@#PSW ;SUPER MODE!!! PREV SUPER MODE!!
012636 012766 177777 177776  MOV    #-1,-2(SSP)

```



```

012644 005037 017000          CLR      @#PHYS      ;PRESET PHYSICAL ADDRESS DATA
012650 005237 177572          INC      @#SRO      ;ENABLE SEG
012654 005557 025120          MFPI    VIRT        ;-(SSP)+VIRT
012660 005037 177572          CLR      @#SRO      ;DISABLE SEG
012664 005716          TST     (SSP)      ;CHECK RESULT
012666 001401          BEQ     .+4
012670 000000          HLT
012672 104000          SCOPE
                                ;ERROR! INCORRECT RESULT

                                ;DM=7,PC
012674 012767 050000 165074          MOV     @SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012702 005066 177776          CLR     -2(SSP)
012706 012737 040004 001004          MOV     @VIRT+4,@#TEMP ;LOAD ADDRESS
012714 012737 177777 017004          MOV     @-1,@#PHYS+4 ;PRESET DATA
012722 005237 177572          INC     @#SRO      ;ENABLE SEG
012726 000277          SCC
012730 006577 166050          MFPI    @TEMP      ;-(SSP)+VIRT+4
012734 016702 165036          MOV     PSW,R2     ;SAVE CC'S
012740 005037 177572          CLR     @#SRO      ;DISABLE SEG
012744 122702 000011          CMPB   @N+C,R2    ;CHECK CC'S
012750 001401          BEQ     .+4
012752 000000          HLT
012754 005216          INC     (SSP)      ;ERROR! INCORRECT CC'S
012756 001401          BEQ     .+4      ;CHECK RESULT
012760 000000          HLT
012762 104000          SCOPE
                                ;ERROR! INCORRECT RESULT ON STACK

                                ;DM=2,PC
012764 012767 050000 165004          MOV     @SM+PSM,PSW ;SUPER MODE!!!,PREV SUPER MODE!!
012772 012766 177777 177776          MOV     @-1,-2(SSP)
013000 005237 177572          INC     @#SRO
013004 006527          MFPI    (PC)+     ;ENABLE SEG
013006 000000          HLT              ;PUSH NEXT WORD ON THE STACK
                                ;THIS IS THE DATA, IF PROG HALTS
                                ;HERE THEN AUTO-INC PC FAILED
                                ;CHECK DATA ON THE STACK
013010 005716          TST     (SSP)
013012 001401          BEQ     .+4
013014 000000          HLT
013016 005037 177572          CLR     @#SRO
013022 104000          SCOPE
                                ;ERROR! INCORRECT DATA ON THE STACK.
                                ;DISABLE SEG

```



```

;TEST MFPI INSTRUCTION SUPER MODE PREVIOUS USER MODE.
;VIRT=120000 ;USER VIRTUAL 'I' ADDRESS FOR THESE TESTS
;PHYS=17200 ;CORRESPONDING USER PHYSICAL ADDRESS

120000
017200

;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R10)
;TEST THAT MFPI CAN GET DATA FROM A USER VIRTUAL ADDRESS
;DM=2
SUI2:
013024 012767 074000 164744 MOV #SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
013032 012766 177777 177776 MOV # -1,-2(SSP)
013040 012702 120000 MOV #VIRT,R12 ;R12=VIRTUAL ADDRESS
013044 005037 017200 CLR @#PHYS ;PRESET PHYSICAL ADDRESS
013050 005237 177572 INC @#SRO ;ENABLE SEG
013054 006522 MFPI (R12)+ ;-(SSP)+VIRT
013056 005037 177572 CLR @#SRO ;DISABLE SEG
013062 005716 TST (SSP) ;CHECK RESULT
013064 001401 BEQ .+4
013066 000000 HLT ;ERROR! INCORRECT RESULT ON STACK
013070 022702 120002 CMP #VIRT+2,R12 ;CHECK AUTO INCREMENT
013074 001401 BEQ .+4
013076 000000 HLT ;ERROR! AUTO INCREMENT FAILED
013100 005067 164672 CLR PSW
013104 104000 SCOPE

;DM=3
013106 012767 070000 164662 MOV #SM+PUM,PSW ;SUPER MODE!!!,PREV USER MODE!!
013114 005066 177776 CLR -2(SSP)
013120 012702 001004 MOV #TEMP,R2 ;LOAD INDIRECT ADDRESS
013124 012737 120002 001004 MOV #VIRT+2,@#TEMP ;LOAD ADDRESS
013132 012737 177777 017202 MOV # -1,@#PHYS+2 ;PRESET DATA
013140 005237 177572 INC @#SRO ;ENABLE SEG
013144 006532 MFPI @#(R2)+ ;-(SSP)+VIRT+2
013146 005037 177572 CLR @#SRO ;DISABLE SEG
013152 005216 INC (SSP) ;CHECK RESULT
013154 001401 BEQ .+4
013156 000000 HLT ;ERROR! INCORRECT RESULT
013160 104000 SCOPE

;DM=4
SUI4:
013162 012767 070000 164606 MOV #SM+PUM,PSW ;SUPER MODE!!!,PREV USER MODE!!
013170 012766 177777 177776 MOV # -1,-2(SSP)
013176 012704 120002 MOV #VIRT+2,R4 ;R4=VIRTUAL ADDRESS+2
013202 005037 017200 CLR @#PHYS ;PRESET PHYSICAL ADDRESS DATA
013206 005237 177572 INC @#SRO ;ENABLE SEG
013212 006544 MFPI -(R4) ;-(SSP)+VIRT
013214 005037 177572 CLR @#SRO ;DISABLE SEG
013220 022704 120000 CMP #VIRT,R4 ;CHECK AUTO-DECREMENT
013224 001401 BEQ .+4
013226 000000 HLT ;ERROR! AUTO-DECREMENT FAILED
013230 005716 TST (SSP) ;CHECK RESULT
013232 001401 BEQ .+4
013234 000000 HLT ;ERROR! INCORRECT RESULT
013236 104000 SCOPE

;DM=5

```



```

013240 012767 074000 164530      MOV      #SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
013246 005066 177776      CLR      -2(SSP)
013252 012700 001006      MOV      #TEMP+2,R10    ;R10=INDIRECT ADDRESS
013256 012737 120004 001004      MOV      #VIRT+4,#TEMP ;LOAD ADDRESS
013264 012737 177777 017204      MOV      #-1,#PHYS+4   ;PRESET PHYSICAL ADDRESS DATA
013272 005237 177572      INC      @#SRO          ;ENABLE SEG
013276 006550      SUI5:    MFPI      @-(R10) ;-(SSP)+VIRT+4
013300 005037 177572      CLR      @#SRO          ;DISABLE SEG
013304 005216      INC      (SSP)          ;CHECK RESULT
013306 001401      BEQ     .+4
013310 000000      HLT
013312 005067 164460      CLR      PSW
013316 104000      SCOPE

```

```

;DM=6
013320 012767 074000 164450      MOV      #SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
013326 012766 177777 177776      MOV      #-1,-2(SSP)
013334 012702 000002      MOV      #2,R12        ;LOAD INDEX REGISTER
013340 005037 017202      CLR      @#PHYS+2     ;PRESET PHYSICAL ADDRESS DATA
013344 005237 177572      INC      @#SRO          ;ENABLE SEG
013350 006562 120000      SUI6:    MFPI      VIRT(R12) ;-(SSP)+VIRT-2
013354 005037 177572      CLR      @#SRO          ;DISABLE SEG
013360 022706 000676      CMP     #SPTR-2,SSP   ;CHECK STACK PTR
013364 001401      BEQ     .+4
013366 000000      HLT                    ;ERROR! INCORRECT STACK PTR
013370 005716      TST     (SSP)          ;CHECK RESULT
013372 001401      BEQ     .+4
013374 000000      HLT                    ;ERROR! INCORRECT RESULT
013376 005067 164374      CLR      PSW
013402 104000      SCOPE

```

```

;DM=7
013404 012767 070000 164364      MOV      #SM+PUM,PSW   ;SUPER MODE!!!,PREV USER MODE!!
013412 005066 177776      CLR      -2(SSP)
013416 012702 177774      MOV      #-4,R2        ;LOAD INDEX REGISTER
013422 012737 120000 001004      MOV      #VIRT,#TEMP   ;LOAD ADDRESS
013430 012737 177777 017200      MOV      #-1,#PHYS     ;CLEAR PHYSICAL ADDRESS DATA
013436 005237 177572      INC      @#SRO          ;ENABLE SEG
013442 006572 001010      SUI7:    MFPI      @TEMP+4(R2) ;-(SSP)+VIRT
013446 005037 177572      CLR      @#SRO          ;DISABLE SEG
013452 005216      INC      (SSP)          ;CHECK RESULT
013454 001401      BEQ     .+4
013456 000000      HLT                    ;ERROR! INCORRECT RESULT
013460 104000      SCOPE

```

```

;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
013462 012767 070000 164306      MOV      #SM+PUM,PSW   ;SUPER MODE!!!,PREV USER MODE!!
013470 005066 177776      CLR      -2(SSP)
013474 005237 177572      INC      @#SRO          ;ENABLE SEG
013500 000277      SCC
013502 006507      SUI10:  MFPI      PC      ;-(SSP)+PC
013504 016702 164266      MOV      PSW,R2        ;SAVE CC'S
013510 005037 177572      CLR      @#SRO          ;DISABLE SEG
013514 122702 000001      CMPB   #C,R2          ;CHECK CC'S
013520 001401      BEQ     .+4

```



```

013522 000000          HLT
013524 022706 000676  CMP      #SPTR-2,SSP      ;CHECK STACK PTR
013530 001401          BEQ      .+4
013532 000000          HLT      ;ERROR! STACK NOT PUSHED
013534 022716 013504  CMP      #SUI10+2,(SSP) ;CHECK THAT PC WAS PUSHED ON THE STACK
013540 001401          BEQ      .+4
013542 000000          HLT      ;ERROR! PC NOT PUSHED ON THE STACK
013544 104000          SCOPE

```

```

;DM=3,PC
013546 012767 074000 164222 MOV      #SM+PUM+REG,PSW ;SUPER MODE!!!,PREV USER MODE!!
013554 005066 177776          CLR      -2(SSP)
013560 012737 177777 017200 MOV      #-1,@#PHYS
013566 005237 177572          INC      @#SRO      ;ENABLE SEG
013572 006537 120000 SUI11: MFPI @#VIRT      ;-(SSP)+VIRT
013576 005037 177572          CLR      @#SRO      ;DISABLE SEG
013602 005216          INC      (SSP)      ;CHECK RESULT
013604 001401          BEQ      .+4
013606 000000          HLT      ;ERROR! INCORRECT RESULT
013610 104000          SCOPE

```

```

;DM=6,PC
013612 012737 070340 177776 MOV      #SM+PUM+PRTY7,@#PSW ;SUPER MODE!!! PREV USER MODE!!
013620 012766 177777 177776 MOV      #-1,-2(SSP)
013626 005037 017200          CLR      @#PHYS      ;PRESET PHYSICAL ADDRESS DATA
013632 005237 177572          INC      @#SRO      ;ENABLE SEG
013636 006567 104136 SUI12: MFPI VIRT      ;-(SSP)+VIRT
013642 005037 177572          CLR      @#SRO      ;DISABLE SEG
013646 005716          TST      (SSP)      ;CHECK RESULT
013650 001401          BEQ      .+4
013652 000000          HLT      ;ERROR! INCORRECT RESULT
013654 104000          SCOPE

```

```

;DM=7,PC
013656 012767 070000 164112 MOV      #SM+PUM,PSW      ;SUPER MODE!!!,PREV USER MODE!!
013664 005066 177776          CLR      -2(SSP)
013670 012737 120004 001004 MOV      #VIRT+4,@#TEMP ;LOAD ADDRESS
013676 012737 177777 017204 MOV      #-1,@#PHYS+4 ;PRESET DATA
013704 005237 177572          INC      @#SRO      ;ENABLE SEG
013710 000277          SCC
013712 006577 165066 SUI13: MFPI @TEMP      ;-(SSP)+VIRT+4
013716 016702 164054          MOV      PSW,R2      ;SAVE CC'S
013722 005037 177572          CLR      @#SRO      ;DISABLE SEG
013726 122702 000011          CMPB   #N+C,R2      ;CHECK CC'S
013732 001401          BEQ      .+4
013734 000000          HLT      ;ERROR! INCORRECT CC'S
013736 005216          INC      (SSP)      ;CHECK RESULT
013740 001401          BEQ      .+4
013742 000000          HLT      ;ERROR! INCORRECT RESULT ON STACK
013744 104000          SCOPE

```

```

;DM=2,PC
013746 012767 070000 164022 MOV      #SM+PUM,PSW      ;SUPER MODE!!!,PREV USER MODE!!
013754 012766 177777 177776 MOV      #-1,-2(SSP)
013762 012737 014006 000250 MOV      #SUI14A,@#MMVEC
013770 012737 040000 000252 MOV      #SM,@#MMVEC+2 ;WILL BE IN SUPER MODE ON ABORT

```


013776	005237	177572			INC	@#SRO		:ENABLE SEG
014002	006517			SUI14:	MFPI	(PC)		:ABORTS WHEN NEXT WORD IS PUSHED
014004	000000				HLT			:ERROR! FAILED TO ABORT
014006	042737	000001	177572	SUI14A:	BIC	#1,@#SRO		:TURN SEG OFF
014014	022737	140140	177572		CMP	#NRA+PLA+UPG+IS+VPO,@#SRO		:CHECK ABORT CONDITIONS
014022	001401				BEQ	.+4		
014024	000000				HLT			:ERROR! INCORRECT ABORT CONDITIONS
014026	022737	014002	177576		CMP	#SUI14,@#SR2		:CHECK PC OF ABORTED INST
014034	001401				BEQ	.+4		
014036	000000				HLT			:INCORRECT PC STORED IN SR2
014040	005037	177572			CLR	@#SRO		:DISABLE SEG
014044	022706	000674			CMP	#SPTR-4,SSP		:CHECK STACK PTR
014050	001401				BEQ	.+4		
014052	000000				HLT			:ERROR! INCORRECT STACK PTR
014054	012737	000520	000250		MOV	#MMERR,@#MMVEC		
014062	005037	000252			CLR	@#MMVEC+2		
014066	104000				SCOPE			


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

```
;SETUP USER MEM MGMT REGISTERS FOR THE TEST.
014070 012737 057016 177600      MOV      #137*256.-400+DWN+RW,@#UIPDR0 ;LOAD UIPDR0 RW DWN 137 BLOCKS
014076 012737 004006 177620      MOV      #11*256.-400+UP+RW,@#UDPDR0 ;LOAD UDPDR0 RW UP 11 BLOCKS
014104 012737 077406 177636      MOV      #200*256.-400+UP+RW,@#UDPDR7 ;LOAD UDPDR7 RW UP 200 BLOCKS
014112 012767 007600 163556      MOV      #7600,UDPAR7
                                VIRT=100000 ;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
                                PHYS=17300 ;CORRESPONDING USER PHYSICAL ADDRESS
```

```
;TEST THAT MFPD CAN GET DATA FROM A USER VIRTUAL 'D' ADDRESS
;DM=1
```

```
014120 012767 170000 163650      MOV      #UM+PUM,PSW ;USER MODE!!!,PREV USER MODE!!
014126 005066 177776              CLR      -2(USP)
014132 012702 100000              MOV      #VIRT,R2 ;R2=VIRTUAL ADDRESS
014136 012737 177777 017300      MOV      #-1,@#PHYS ;PRESET PHYSICAL ADDRESS
014144 005237 177572              INC      @#SRO ;ENABLE SEG
014150 000277              SCC ;PRESET CC'S
014152 106512              MFPD (R2) ;-(USP)+(R2)
UU1: 014154 016703 163616      MOV      PSW,R3 ;SAVE CC'S
014160 005037 177572      CLR      @#SRO ;DISABLE SEG
014164 122703 000011      CMPB    #N+C,R3 ;CHECK CC'S
014170 001401      BEQ     .+4
014172 000000      HLT ;ERROR! INCORRECT CC'S
014174 022706 000576      CMP     #UPTR-2,USP ;CHECK THAT STACK WAS PUSHED
014200 001401      BEQ     .+4
014202 000000      HLT ;ERROR! INCORRECT STACK PTR
014204 005216      INC     (USP) ;CHECK RESULT
014206 001401      BEQ     .+4
014210 000000      HLT ;ERROR! INCORRECT RESULT
014212 104000      SCOPE
```

```
;DM=3
```

```
014214 012767 170000 163554      MOV      #UM+PUM,PSW ;USER MODE!!!,PREV USER MODE!!
014222 005066 177776              CLR      -2(USP)
014226 012702 100000              MOV      #VIRT,R2 ;LOAD INDIRECT ADDRESS
014232 012737 100002 017300      MOV      #VIRT+2,@#PHYS ;LOAD ADDRESS
014240 012737 177777 017302      MOV      #-1,@#PHYS+2 ;PRESET DATA
014246 005237 177572              INC      @#SRO ;ENABLE SEG
UU3: 014252 106532      MFPD @#SRO ;-(USP)+VIRT
014254 005037 177572      CLR      @#SRO ;DISABLE SEG
014260 005216      INC     (USP) ;CHECK RESULT
014262 001401      BEQ     .+4
014264 000000      HLT ;ERROR! INCORRECT RESULT
014266 104000      SCOPE
```



```

;DM=5
014270 012767 174000 163500 MOV #UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
014276 005066 177776 CLR -2(USP)
014302 012700 100002 MOV #VIRT+2,R10 ;R10=INDIRECT ADDRESS
014306 012737 100004 017300 MOV #VIRT+4,#PHYS ;LOAD ADDRESS
014314 012737 177777 017304 MOV #-1,#PHYS+4 ;PRESET PHYSICAL ADDRESS DATA
014322 005237 177572 INC #SRO ;ENABLE SEG
014326 106550 UUS: MFPD #-(R10) ;-(USP)+VIRT+4
014330 005037 177572 CLR #SRO ;DISABLE SEG
014334 005216 INC (USP) ;CHECK RESULT
014336 001401 BEQ .+4
014340 000000 HLT
014342 005067 163430 CLR PSW
014346 104000 SCOPE

;DM=7
014350 012767 170000 163420 MOV #UM+PUM,PSW ;USER MODE!!!,PREV USER MODE!!
014356 005066 177776 CLR -2(USP)
014362 012702 000004 MOV #4,R2 ;LOAD INDEX REGISTER
014366 012737 100000 017304 MOV #VIRT,#PHYS+4 ;LOAD ADDRESS
014374 012737 177777 017300 MOV #-1,#PHYS ;CLEAR PHYSICAL ADDRESS DATA
014402 005237 177572 INC #SRO ;ENABLE SEG

U7: MFPD #VIRT(R2) ;-(USP)+VIRT
CLR #SRO ;DISABLE SEG
INC (USP) ;CHECK RESULT
BEQ .+4
HLT ;ERROR! INCORRECT RESULT
SCOPE

;TEST THAT MFPD OPERATES PROPERLY US PC IN DESTINATION
;DM=0,PC
014426 012767 170000 163342 MOV #UM+PUM,PSW ;USER MODE!!!,PREV USER MODE!!
014434 005066 177776 CLR -2(USP)
014440 005237 177572 INC #SRO ;ENABLE SEG
014444 000277 SCC
014446 106507 U10: MFPD PC ;-(USP)+PC
014450 016702 163322 MOV PSW,R2 ;SAVE CC'S
014454 005037 177572 CLR #SRO ;DISABLE SEG
014460 122702 000001 CMPB #C,R2 ;CHECK CC'S
014464 001401 BEQ .+4
014466 000000 HLT
014470 022706 000576 CMP #UPTR-2,USP ;CHECK STACK PTR
014474 001401 BEQ .+4
014476 000000 HLT ;ERROR! STACK NOT PUSHED
014500 022716 014450 CMP #U10+2,(USP) ;CHECK THAT PS WAS PUSHED ON THE STACK
014504 001401 BEQ .+4
014506 000000 HLT ;ERROR! PC NOT PUSHED ON THE STACK
014510 104000 SCOPE

;DM=3,PC
014512 012767 174000 163256 MOV #UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
014520 005066 177776 CLR -2(USP)

```



```

;TEST MFPI INSTRUCTION USER MODE PREVIOUS USER MODE
;NOTE: MFPI IN USER MODE, PREVIOUS USER MODE OPERATES AS A MFPD INSTRUCTION
;USER VIRTUAL 'D' ADDRESS FOR THESE TESTS
;CORRESPONDING USER PHYSICAL ADDRESS
      100000
      017300
014646 012767 174000 163122      MOV      @UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
014654 005066 177776              CLR      -2(SSP)
014660 012703 177777              MOV      0-1,R13      ;PRESET GENERAL REGISTER
014664 005237 177572              INC      @SRO         ;ENABLE SEG
014670 006503              MFPI    R13          ;-(USP)+R13
014672 016702 163100              MOV      PSM,R12     ;SAVE STATUS AFTER MFPI
014676 005037 177572              CLR      @SRO         ;DISABLE SEG
014702 022702 174010              CMP      @UM+PUM+REG+N,R12 ;CHECK STATUS AFTER MFPI
014706 001401              BEQ     .+4
014710 000000              HLT
014712 022706 000576              CMP      @UPTR-2,USP ;ERROR! INCORRECT STATUS AFTER MFPI
014716 001401              BEQ     .+4          ;CHECK THAT STACK WAS PUSHED
014720 000000              HLT
014722 005216              INC     (USP)        ;ERROR! INCORRECT STACK PTR
014724 001401              BEQ     .+4          ;CHECK RESULT
014726 000000              HLT
014730 104000              SCOPE                ;ERROR! INCORRECT RESULT

```

```

;TEST THAT MFPI CAN GET DATA FROM A USER VIRTUAL 'D' ADDRESS
;DM=2
014732 012767 174000 163036      MOV      @UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
014740 012766 177777 177776      MOV      0-1,-2(USP)
014746 012702 100000              MOV      @VIRT,R12   ;R12=VIRTUAL ADDRESS
014752 005037 017300              CLR      @PHYS       ;PRESET PHYSICAL ADDRESS
014756 005237 177572              INC      @SRO        ;ENABLE SEG
014762 006522              MFPI    (R12)+      ;-(USP)+VIRT
014764 005037 177572              CLR      @SRO        ;DISABLE SEG
014770 005716              TST     (USP)        ;CHECK RESULT
014772 001401              BEQ     .+4
014774 000000              HLT
014776 022702 100002              CMP      @VIRT+2,R12 ;ERROR! INCORRECT RESULT ON STACK
015002 001401              BEQ     .+4          ;CHECK AUTO INCREMENT
015004 000000              HLT
015006 005067 162764              CLR     PSM          ;ERROR! AUTO INCREMENT FAILED
015012 104000              SCOPE

```

```

;DM=4
015014 012767 170000 162754      MOV      @UM+PUM,PSW  ;USER MODE!!!,PREV USER MODE!!
015022 012766 177777 177776      MOV      0-1,-2(USP)
015030 012704 100002              MOV      @VIRT+2,R4  ;R4=VIRTUAL ADDRESS+2
015034 005037 017300              CLR      @PHYS       ;PRESET PHYSICAL ADDRESS DATA
015040 005237 177572              INC      @SRO        ;ENABLE SEG
015044 006544              MFPI    -(R4)        ;-(USP)+VIRT
015046 005037 177572              CLR      @SRO        ;DISABLE SEG
015052 022704 100000              CMP      @VIRT,R4    ;CHECK AUTO-DECREMENT
015056 001401              BEQ     .+4
015060 000000              HLT
015062 005716              TST     (USP)        ;ERROR! AUTO-DECREMENT FAILED
015064 001401              BEQ     .+4          ;CHECK RESULT
015066 000000              HLT                  ;ERROR! INCORRECT RESULT

```


015070 104000

SCOPE

```

;DM=6
015072 012767 174000 162676 MOV #UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
015100 012766 177777 177776 MOV #1,-2(USP)
015106 012702 000002 MOV #2,R12 ;LOAD INDEX REGISTER
015112 005037 017302 CLR @#PHYS+2 ;PRESET PHYSICAL ADDRESS DATA
015116 005237 177572 INC @#SRO ;ENABLE SEG
015122 006562 100000 UUI6: MFPI VIRT(R12) ;-(USP)+VIRT-2
015126 005037 177572 CLR @#SRO ;DISABLE SEG
015132 022706 000576 CMP @PTR-2,USP ;CHECK STACK PTR
015136 001401 BEQ .+4
015140 000000 HLT ;ERROR! INCORRECT STACK PTR
015142 005716 TST (USP) ;CHECK RESULT
015144 001401 BEQ .+4
015146 000000 HLT ;ERROR! INCORRECT RESULT
015150 005067 162622 CLR PSW
015154 104000 SCOPE

```

;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
;DM=3,PC

```

015156 012767 174000 162612 MOV #UM+PUM+REG,PSW ;USER MODE!!!,PREV USER MODE!!
015164 005066 177776 CLR -2(USP)
015170 012737 177777 017300 MOV #1,@#PHYS
015176 005237 177572 INC @#SRO ;ENABLE SEG
015202 006537 100000 UUI11: MFPI @#VIRT ;-(USP)+VIRT
015206 005037 177572 CLR @#SRO ;DISABLE SEG
015212 005216 INC (USP) ;CHECK RESULT
015214 001401 BEQ .+4
015216 000000 HLT ;ERROR! INCORRECT RESULT
015220 104000 SCOPE

```

;DM=6,PC

```

015222 012767 170340 162546 MOV #UM+PUM+PRTY7,PSW ;USER MODE!!! PREV USER MODE!!
015230 012766 177777 177776 MOV #1,-2(USP)
015236 005037 017300 CLR @#PHYS ;PRESET PHYSICAL ADDRESS DATA
015242 005237 177572 INC @#SRO ;ENABLE SEG
015246 006567 062526 UUI12: MFPI VIRT ;-(USP)+VIRT
015252 005037 177572 CLR @#SRO ;DISABLE SEG
015256 005716 TST (USP) ;CHECK RESULT
015260 001401 BEQ .+4
015262 000000 HLT ;ERROR! INCORRECT RESULT
015264 104000 SCOPE

```

;*****IMPORTANT NOTE*****
;NO CODE ALLOWED BETWEEN 16600-177776

```

015266 005267 163506 END: INC ICNT ;INC PASS COUNT
015272 026727 163502 005000 CMP ICNT,#5000
015300 001402 BEQ DONE
015302 000167 163570 JMP BEGIN ;RESTART TEST
015306 012767 000007 162252 DONE: MOV #7,TPB ;RING BELL
015314 105767 162244 TSTB TPS ;WAIT FOR BELL
015320 100375 BPL .-4 ;TO RING
015322 013700 000042 MOV @#42,R0 ;RETURN TO
015326 001405 BEQ HERE ;MONITOR

```


015330 000005
015332 010700
015334 000240
015336 000240
015340 000240
015342 000167 163522
000001

SENDAD: RESET
MOV PC,RO
NOP
NOP
HERE: JMP START
.END

;RESTART TEST

KPAR = 172360	490#	
KPAR0 = 172360	470#	604#
KPAR1 = 172362	471#	
KPAR2 = 172364	472#	
KPAR3 = 172366	473#	
KPAR4 = 172370	474#	
KPAR5 = 172372	475#	
KPAR6 = 172374	476#	605#
KPAR7 = 172376	477#	606#
KPDR = 172320	488#	
KPDR0 = 172320	452#	596#
KPDR1 = 172322	453#	
KPDR2 = 172324	454#	
KPDR3 = 172326	455#	
KPDR4 = 172330	456#	
KPDR5 = 172332	457#	
KPDR6 = 172334	458#	597#
KPDR7 = 172336	459#	598#
KIPAR = 172340	489#	
KIPAR0 = 172340	461#	603#
KIPAR1 = 172342	462#	
KIPAR2 = 172344	463#	
KIPAR3 = 172346	464#	
KIPAR4 = 172350	465#	
KIPAR5 = 172352	466#	
KIPAR6 = 172354	467#	
KIPAR7 = 172356	468#	
KIPDR = 172300	487#	
KIPDR0 = 172300	443#	595#
KIPDR1 = 172302	444#	
KIPDR2 = 172304	445#	
KIPDR3 = 172306	446#	
KIPDR4 = 172310	447#	
KIPDR5 = 172312	448#	
KIPDR6 = 172314	449#	
KIPDR7 = 172316	450#	
KKIO 005030	1276#	
KKIOA 005006	1271#	
KKI1 005122	1298#	
KKI10 005636	1412#	1421
KKI11 005726	1433#	
KKI12 005772	1445#	
KKI13 006044	1459#	
KKI14 006112	1473#	
KKI14A 006114	1474#	1476
KKI2 005214	1318#	
KKI3 005302	1336#	
KKI4 005346	1349#	
KKI5 005432	1366#	
KKI6 005504	1380#	
KKI7 005574	1398#	
KKO 001352	624#	
KKOA 001330	613#	619#
KK1 001444	646#	
KK10 002156	759#	768
KK11 002246	780#	

K05

PIR4 = 010000	312#													
PKM = 000000	271#													
PLA = 040000	335#	824	2524											
PRTY4 = 000200	266#													
PRTY7 = 000340	265#	620	627	788	1006	1223	1272	1279	1441	1658	1872	1929	1936	
	2011	2179	2311	2486	2761									
PSM = 010000	272#	836	858	879	896	910	926	941	958	973	994	1006	1018	
	1036	1487	1509	1530	1547	1561	1577	1592	1609	1625	1646	1658	1670	
	1687	1929	1948	1965	1981	1999	2011	2023	2205	2212	2225	2246	2260	
PSW = 177776	2275	2290	2311	2323	2341									
	287#	547#	549#	620#	625	640#	647	661#	674#	678#	692#	707#	718#	
	722#	735#	739#	754#	760	776#	788#	800#	807	836#	842	853#	858#	
	865	879#	892#	896#	910#	926#	937#	941#	954#	958#	973#	978	994#	
	1006#	1018#	1025	1036#	1054#	1060	1071#	1076#	1083	1097#	1110#	1114#	1128#	
	1143#	1154#	1158#	1171#	1175#	1190#	1195	1211#	1223#	1235#	1242	1252#	1272#	
	1277	1292#	1299	1313#	1326#	1330#	1344#	1360#	1371#	1375#	1388#	1392#	1407#	
	1413	1429#	1441#	1453#	1460	1487#	1493	1504#	1509#	1516	1530#	1543#	1547#	
	1561#	1577#	1588#	1592#	1605#	1609#	1625#	1630	1646#	1658#	1670#	1677	1687#	
	1704#	1710	1721#	1726#	1733	1747#	1760#	1764#	1778#	1794#	1805#	1809#	1822#	
	1826#	1841#	1846	1860#	1872#	1884#	1891	1901#	1929#	1934	1948#	1961#	1965#	
	1981#	1994#	1999#	2011#	2023#	2030	2044#	2050	2061#	2066#	2073	2087#	2101#	
	2112#	2116#	2129#	2133#	2148#	2153	2167#	2179#	2190#	2205#	2210	2225#	2232	
	2246#	2260#	2271#	2275#	2290#	2295	2311#	2323#	2330	2341#	2361#	2374#	2378#	
	2392#	2408#	2419#	2423#	2436#	2440#	2455#	2460	2474#	2486#	2498#	2505	2516#	
	2556#	2563	2577#	2591#	2602#	2606#	2622#	2627	2643#	2655#	2662	2678#	2683	
	2698#	2711#	2715#	2731#	2744#	2749#	2761#							
PUM = 030000	273#	547	1054	1076	1097	1114	1128	1143	1158	1175	1190	1211	1223	
	1235	1252	1704	1726	1747	1764	1778	1794	1809	1826	1841	1860	1872	
	1884	1901	2044	2066	2087	2101	2116	2133	2148	2167	2179	2190	2361	
	2378	2392	2408	2423	2440	2455	2474	2486	2498	2516	2556	2577	2591	
	2606	2622	2643	2655	2678	2685	2698	2715	2731	2749	2761			
RDO = 000002	495#													
RDOT = 000001	494#													
REG = 004000	267#	274#	661	707	722	776	836	879	926	941	994	1054	1097	
	1143	1158	1211	1313	1360	1375	1429	1487	1530	1577	1592	1646	1704	
	1747	1794	1809	1860	1948	1981	1999	2044	2101	2116	2167	2205	2212	
	2260	2361	2408	2423	2474	2591	2643	2678	2685	2698	2731	2749		
RW = 000006	499#	595	596	597	598	599	600	601	602	1921	1922	1923	2547	
	2548	2549												
RWT = 000004	497#													
RWTH = 000005	498#													
RO = %000000	241#	2782#	2785#											
R1 = %000001	242#	541#	544											
R10 = %000000	248#	709#	713	838#	841	928#	932	1056#	1059	1145#	1149	1362#	1366	
	1489#	1492	1579#	1583	1706#	1709	1796#	1800	2046#	2049	2103#	2107	2262#	
	2266	2410#	2414	2593#	2597									
R11 = %000001	249#													
R12 = %000002	250#	663#	666	671	724#	727	881#	884	889	943#	946	1099#	1102	
	1107	1160#	1163	1315#	1318	1323	1377#	1380	1532#	1535	1540	1594#	1597	
	1749#	1752	1757	1811#	1814	1950#	1953	1958	1983#	1986	2118#	2121	2210#	
	2212	2363#	2366	2371	2425#	2428	2683#	2685	2700#	2703	2708	2733#	2736	
R13 = %000003	251#	2207#	2209	2680#	2682									
R14 = %000004	252#	842#	844	1060#	1062	1493#	1495	1710#	1712	2050#	2052			
R15 = %000005	253#													
R2 = %000002	243#	584#	586#	588#	590#	625#	627	642#	646	680#	684	741#	745	
	760#	762	807#	809	860#	864	898#	902	960#	964	978#	980	1025#	

SIPAR7=	172256	432#												
SIPDR =	172200	483#												
SIPDR0=	172200	407#	588	1921*										
SIPDR1=	172202	408#												
SIPDR2=	172204	409#	600*											
SIPDR3=	172206	410#												
SIPDR4=	172210	411#												
SIPDR5=	172212	412#												
SIPDR6=	172214	413#												
SIPDR7=	172216	414#												
SLR =	177774	288#	578*											
SM =	040000	269#	1929	1948	1965	1981	1999	2011	2023	2044	2066	2087	2101	2116
		2133	2148	2167	2179	2190	2205	2212	2225	2246	2260	2275	2290	2311
		2323	2341	2361	2378	2392	2408	2423	2440	2455	2474	2486	2498	2516
		2519												
SPG =	000040	327#												
SPTR =	000700	300#	545	1939	1988	2055	2078	2123	2158	2197	2215	2237	2300	2430
		2465	2531											
SRO =	177572	365#	531*	557	558*	583*	623*	626*	644*	648*	665*	667*	683*	685*
		696#	698*	712*	714*	726*	728*	744*	746*	757*	761*	779*	781*	791*
		793#	804*	808*	820*	824	827*	839*	843*	862*	866*	883*	885*	901*
		903#	914*	916*	931*	933*	945*	947*	963*	965*	975*	979*	997*	999*
		1009#	1011*	1022*	1026*	1040*	1042*	1057*	1061*	1080*	1084*	1101*	1103*	1119*
		1121#	1132*	1134*	1148*	1150*	1162*	1164*	1180*	1182*	1192*	1196*	1214*	1216*
		1226#	1228*	1239*	1243*	1256*	1258*	1275*	1278*	1296*	1300*	1317*	1319*	1335*
		1337#	1348*	1350*	1365*	1367*	1379*	1381*	1397*	1399*	1410*	1414*	1432*	1434*
		1444#	1446*	1457*	1461*	1472*	1475*	1490*	1494*	1513*	1517*	1534*	1536*	1552*
		1554#	1565*	1567*	1582*	1584*	1596*	1598*	1614*	1617*	1627*	1631*	1649*	1651*
		1661#	1663*	1674*	1678*	1690*	1692*	1707*	1711*	1730*	1734*	1751*	1753*	1769*
		1771#	1782*	1784*	1799*	1801*	1813*	1815*	1831*	1833*	1843*	1847*	1863*	1865*
		1875#	1877*	1888*	1892*	1904*	1906*	1932*	1935*	1952*	1954*	1969*	1971*	1985*
		1987#	2002*	2004*	2014*	2016*	2027*	2031*	2047*	2051*	2070*	2074*	2092*	2094*
		2106#	2108*	2120*	2122*	2138*	2140*	2150*	2154*	2170*	2172*	2182*	2184*	2194*
		2196#	2208*	2211*	2229*	2233*	2251*	2253*	2265*	2267*	2280*	2282*	2292*	2296*
		2314#	2316*	2327*	2331*	2343*	2350*	2365*	2367*	2383*	2385*	2396*	2398*	2413*
		2415#	2427*	2429*	2445*	2447*	2457*	2461*	2477*	2479*	2489*	2491*	2502*	2506*
		2520#	2523*	2524	2530*	2560*	2564*	2582*	2584*	2596*	2598*	2611*	2614*	2624*
		2628#	2646*	2648*	2659*	2663*	2681*	2684*	2702*	2704*	2719*	2721*	2735*	2737*
		2752#	2754*	2764*	2766*									
		557*	564#											
SROT	001002													
SR1 =	177574	366#												
SR2 =	177576	367#	2527											
SR3 =	172516	368#	579*											
SSI0	012174	2209#												
SSI1	012270	2231#												
SSI10	012564	2294#	2303											
SSI12	012654	2315#												
SSI13	012730	2329#												
SSI14	013004	2344#												
SSI3	012370	2252#												
SSI5	012444	2266#												
SSI7	012524	2281#												
SSP =	%000006	256#	550*	1038*	1041	1930*	1939	1949*	1955	1966*	1975	1982*	1988	1991
		2000#	2005*	2012*	2017	2024*	2035*	2045*	2055	2058	2067*	2078	2081*	2088*
		2095#	2102*	2109*	2117*	2123	2126	2134*	2141*	2149*	2158	2161	2168*	2173*
		2180#	2185	2191*	2192*	2195	2206*	2215	2226*	2237	2240*	2247*	2254*	2261*

VP0 = 000000
VP1 = 000002
VP2 = 000004
VP3 = 000006
VP4 = 000010
VP5 = 000012
VP6 = 000014
VP7 = 000016
MBIT = 000100
Z = 000004
SENDAD = 015332
 = 015346

1395	1433	1445	1455	1483	1511	1532	1540	1550	1563	1568	1580	1597
1612	1650	1662	1672	1688	1700	1728	1749	1757	1767	1780	1785	1797
1814	1829	1864	1876	1886	1902	1926	1950	1958	1967	1972	1986	2003
2015	2025	2029	2040	2068	2090	2104	2121	2136	2171	2183	2192	2202
2227	2249	2263	2278	2315	2325	2355	2363	2371	2381	2394	2399	2411
2428	2443	2478	2490	2500	2551	2558	2579	2580	2593	2594	2609	2613
2647	2657	2661	2675	2700	2708	2717	2722	2736	2753	2765		
316	824	2524										
317												
318												
319												
320												
321												
322												
323												
343												
2622	844	1062	1495	1712	2052							
514	2785											
516	518											
591	628	518	520	522	524	526	528	561	565	566	567	587
730	733	631	634	650	653	656	669	672	687	700	703	716
851	868	748	763	766	769	783	795	810	813	825	845	848
981	984	871	874	887	890	905	918	921	935	949	952	967
1092	1105	987	1001	1013	1028	1031	1044	1063	1066	1069	1086	1089
1218	1230	1108	1123	1136	1139	1152	1166	1169	1184	1198	1201	1204
1339	1352	1245	1248	1260	1280	1283	1286	1302	1305	1308	1321	1324
1466	1474	1355	1369	1383	1386	1401	1416	1419	1422	1436	1448	1463
1572	1586	1477	1496	1499	1502	1519	1522	1525	1538	1541	1556	1569
1713	1716	1600	1603	1619	1633	1636	1639	1653	1665	1680	1683	1694
1820	1835	1719	1736	1739	1742	1755	1758	1773	1786	1789	1803	1817
1956	1959	1849	1852	1855	1867	1879	1894	1897	1908	1937	1940	1943
2076	2079	1973	1976	1989	1992	2006	2018	2033	2036	2053	2056	2059
2198	2213	2082	2096	2110	2124	2127	2142	2156	2159	2162	2174	2186
2318	2333	2216	2219	2235	2238	2241	2255	2269	2284	2298	2301	2304
2463	2466	2336	2348	2369	2372	2387	2400	2403	2417	2431	2434	2449
2586	2600	2469	2481	2493	2508	2511	2525	2528	2532	2566	2569	2572
2709	2723	2616	2630	2633	2636	2650	2665	2668	2686	2689	2692	2706
		2726	2739	2742	2756	2768	2781					

ADD RSR BEQ	535 534 733 874 1028 1166 1305 1448 1586 1736 1867 2018 2159 2301 2463 2616 2742	552 748 887 1031 1169 1308 1463 1600 1739 1879 2033 2162 2304 2466 2630 2756	628 763 890 1044 1184 1321 1466 1603 1742 1894 2036 2174 2318 2469 2633 2768	631 766 905 1063 1198 1324 1477 1619 1755 1897 2053 2186 2333 2481 2636 2777	634 769 918 1066 1201 1339 1496 1633 1758 1908 2056 2198 2336 2493 2650 2783	650 783 921 1069 1204 1352 1499 1636 1773 1937 2059 2213 2348 2508 2665	653 795 935 1086 1218 1355 1502 1639 1786 1940 2076 2216 2369 2511 2668	656 810 949 1089 1230 1369 1519 1653 1789 1943 2079 2219 2372 2525 2686	669 813 953 1092 1244 1384 1523 1665 1803 1956 2082 2236 2387 2528 2689	672 825 967 1105 1248 1386 1525 1680 1817 1959 2096 2238 2400 2532 2692	687 845 981 1108 1260 1401 1538 1683 1820 1973 2110 2241 2403 2566 2706	700 848 984 1123 1280 1416 1541 1694 1835 1976 2124 2255 2417 2569 2709	703 851 987 1136 1283 1419 1556 1713 1849 1989 2127 2269 2431 2572 2723	716 868 1001 1139 1286 1422 1569 1716 1852 1992 2142 2284 2434 2586 2726	730 871 1013 1152 1302 1436 1572 1719 1855 2006 2156 2298 2449 2600 2739
BIC BIT BPL BR CLR	531 551 2781 613 543 678 754 859 959 1077 1176 1293 1381 1475 1588 1692 1805 1906 2024 2134 2253 2374 2475 2607 2734	537 537 1474 572 679 756 866 965 1084 1182 1300 1388 1489 1595 1706 1812 1930 2031 2140 2261 2379 2479 2614 2737	558 583 685 761 882 974 1100 1191 1316 1392 1494 1598 1711 1815 1935 2046 2149 2267 2385 2488 2623 2744	523 586 692 777 885 979 1103 1196 1319 1393 1494 1504 1605 1721 1822 1951 2051 2154 2271 2395 2491 2628 2750	590 603 698 781 892 995 1110 1212 1326 1399 1407 1510 1610 1727 1827 1954 2061 2168 2276 2398 2499 2644 2754	603 698 790 897 999 1115 1216 1330 1407 1517 1617 1734 1833 1961 2067 2172 2282 2409 2506 2648 2763	604 708 793 903 1008 1121 1225 1331 1409 1533 1626 1750 1842 1968 2074 2181 2291 2415 2530 2656 2766	621 714 800 913 1011 1131 1228 1337 1414 1536 1631 1753 1847 1971 2088 2184 2296 2419 2535 2663	626 718 801 916 1019 1134 1236 1344 1430 1543 1647 1760 1861 1984 2094 2193 2313 2426 2557 2679	640 725 808 927 1026 1144 1243 1347 1434 1548 1651 1765 1865 1987 2102 2196 2316 2429 2564 2684	641 728 819 933 1037 1150 1255 1350 1443 1554 1660 1771 1874 1994 2108 2206 2324 2436 2578 2701	648 735 827 937 1042 1154 1258 1361 1446 1564 1663 1781 1877 2000 2112 2211 2331 2441 2584 2704	664 739 838 944 1056 1161 1273 1367 1453 1567 1671 1784 1885 2004 2119 2226 2350 2447 2592 2711	667 740 843 947 1061 1164 1278 1371 1454 1578 1678 1795 1892 2013 2122 2233 2364 2456 2598 2718	674 746 853 954 1071 1171 1292 1378 1461 1584 1689 1801 1903 2016 2129 2247 2367 2461 2602 2721
CMP	630 1065 1498 1958 2430	652 1088 1521 1972 2465	671 1107 1540 1988 2468	699 1135 1568 2055 2524	729 1165 1599 2078 2527	765 1200 1635 2123 2531	768 1203 1638 2158 2568	824 1282 1715 2161 2632	847 1304 1738 2212 2635	870 1323 1757 2215 2685	889 1351 1785 2237 2688	917 1382 1816 2300 2708	948 1418 1851 2303 2722	983 1421 1854 2371 2738	986 1476 1939 2399 2776
CMPB	627 1462 2297	649 1495 2332	762 1518 2462	809 1632 2507	844 1679 2565	867 1712 2629	980 1735 2664	1027 1848	1062 1893	1085 1936	1197 2032	1244 2052	1279 2075	1301 2155	1415 2234
EMT HALT INC	505 504 623 782 963	514 633 791 966	644 804 975	655 812 997	665 820 1000	683 839 1009	686 862 1022	696 873 1030	712 883 1040	715 901 1057	726 904 1080	744 914 1091	747 931 1101	757 934 1119	779 945 1122

	1132	1148	1151	1162	1180	1183	1192	1214	1217	1226	1239	1247	1256	1259	1275
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	1444	1457	1465	1472	1490	1513	1524	1534	1552	1555	1565	1582	1585	1588	1614
	1618	1627	1649	1652	1661	1674	1682	1690	1707	1730	1741	1751	1769	1772	1782
	1799	1802	1813	1831	1834	1843	1853	1866	1875	1888	1896	1904	1932	1942	1952
	1969	1985	2002	2005	2014	2027	2035	2047	2070	2081	2092	2095	2102	2109	2120
	2138	2141	2150	2170	2173	2182	2194	2208	2218	2229	2240	2251	2254	2265	2268
	2280	2283	2292	2314	2327	2335	2343	2365	2383	2386	2396	2413	2416	2427	2445
	2448	2457	2477	2480	2489	2502	2510	2520	2560	2571	2582	2585	2596	2599	2611
	2615	2624	2646	2649	2659	2667	2681	2691	2702	2719	2735	2752	2755	2764	2775
JMP	527	536	559	2778	2789										
MFPD	624	646	666	684	697	713	727	745	759	780	792	806	821	841	864
	884	902	915	932	946	964	977	998	1010	1024	1041	1059	1082	1102	1120
	1133	1149	1163	1181	1194	1215	1227	1241	1257	1283	1295	1297	1386	2003	2015
	2029	2049	2072	2093	2107	2121	2139	2152	2171	2183	2195	2562	2583	2597	2613
MFPD	2626	2647	2661												
MFPD	1276	1298	1318	1336	1349	1366	1380	1398	1412	1433	1445	1459	1473	1492	1515
	1535	1553	1566	1583	1597	1616	1629	1650	1662	1676	1691	1709	1732	1752	1770
	1783	1800	1814	1832	1845	1864	1876	1890	1905	2209	2231	2252	2266	2281	2294
	2315	2329	2344	2366	2384	2397	2414	2428	2446	2459	2478	2490	2504	2521	2682
	2703	2720	2736	2753	2765										
MOV	541	542	544	545	546	547	557	574	575	577	578	579	584	585	588
	589	595	596	597	598	599	600	601	602	605	606	608	609	611	612
	620	622	625	642	643	647	661	662	663	680	681	682	693	694	707
	709	710	711	722	723	724	741	742	743	755	760	776	778	788	789
	802	803	807	818	828	836	837	842	858	860	861	865	879	880	881
	896	898	899	900	910	911	912	926	928	929	930	941	942	943	958
	960	961	962	973	978	994	996	1006	1007	1018	1020	1021	1025	1036	1039
	1054	1055	1060	1076	1078	1079	1083	1097	1098	1099	1114	1116	1117	1118	1128
	1129	1130	1143	1145	1146	1147	1158	1159	1160	1175	1177	1178	1179	1190	1195
	1211	1213	1223	1224	1235	1237	1238	1242	1252	1253	1272	1274	1277	1294	1295
	1299	1313	1314	1315	1332	1333	1334	1345	1346	1360	1362	1363	1364	1375	1376
	1377	1394	1395	1396	1408	1413	1429	1431	1441	1442	1455	1456	1460	1471	1487
	1488	1493	1509	1511	1512	1516	1530	1531	1532	1547	1549	1550	1551	1561	1562
	1563	1577	1579	1580	1581	1592	1593	1594	1609	1611	1612	1613	1625	1630	1646
	1648	1658	1659	1670	1672	1673	1677	1687	1688	1704	1705	1710	1726	1728	1729
	1733	1747	1748	1749	1764	1766	1767	1768	1778	1779	1780	1794	1796	1797	1798
	1809	1810	1811	1826	1828	1829	1830	1841	1846	1860	1862	1872	1873	1884	1886
	1887	1891	1901	1902	1921	1922	1923	1924	1929	1931	1934	1948	1949	1950	1965
	1966	1967	1981	1982	1983	1999	2001	2011	2012	2023	2025	2026	2030	2044	2045
	2050	2066	2068	2069	2073	2087	2089	2090	2091	2101	2103	2104	2105	2116	2117
	2118	2133	2135	2136	2137	2148	2153	2167	2169	2179	2180	2190	2191	2192	2205
	2207	2210	2225	2227	2228	2232	2246	2248	2249	2250	2260	2262	2263	2264	2275
	2277	2278	2279	2290	2295	2311	2312	2323	2325	2326	2330	2341	2342	2361	2362
	2363	2378	2380	2381	2382	2392	2393	2394	2408	2410	2411	2412	2423	2424	2425
	2440	2442	2443	2444	2455	2460	2474	2476	2486	2487	2498	2500	2501	2505	2516
	2517	2518	2519	2534	2547	2548	2549	2550	2556	2558	2559	2563	2577	2579	2580
	2581	2591	2593	2594	2595	2606	2608	2609	2610	2622	2627	2643	2645	2655	2657
	2658	2662	2678	2680	2683	2698	2699	2700	2715	2716	2717	2731	2732	2733	2749
	2751	2761	2762	2779	2782	2785									
MOV	553														
MTPD	548	550	1038	1254											
NOP	571	582	2786	2787	2788										
RESET	2784														
RTT	538	554													
SCC	645	758	805	840	863	976	1023	1058	1081	1193	1240	1297	1411	1458	1491

	1514	1628	1675	1708	1731	1844	1889	2028	2048	2071	2151	2230	2293	2328	2458
S08	2503	2561	2625	2660											
SUB	587	591													
TST	532														
	533	668	702	732	794	850	886	920	951	1012	1043	1068	1104	1138	1168
	1229	1320	1354	1385	1447	1501	1537	1571	1602	1664	1693	1718	1754	1788	1819
	1878	1907	1955	1975	1991	2017	2058	2126	2185	2197	2317	2347	2368	2402	2433
	2492	2705	2725	2741	2767										
TSTB	2780														
.ABS	232														
.END	2791														
.LIST	231	508	514	515											
.MACR	508														
.NLIST	230	508	514												
.REM	1														
.REPT	514														
.TITLE	233														
.WORD	517	519	525												

ERRORS DETECTED: 0
DEFAULT GLOBALS GENERATED: 0

#DCKTEB,DCKTEB.SEG/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DCKTEB.P11
RUN-TIME: 9 17 5 SECONDS
RUN-TIME RATIO: 116/33=3.4
CORE USED: 11K (21 PAGES)

