

# PDP11/34

MM ACCESS KEYS TEST  
MD-11-DFKTC-A

EP-DFKTC-A-DL-A  
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**digital**  
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KEY	TEST	RESULT	STATUS
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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DFKTC-A-D
PRODUCT NAME:	HTPI/MFPI WITH MEMORY MANAGEMENT
DATE CREATED:	DECEMBER 21, 1975
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHOR:	GLENN JOHNSON

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1.0 ABSTRACT

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

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/34

2.2 STORAGE

PROGRAM STORAGE - THE ROUTINE USES MEMORY 0-17777

3.0 LOADING AND STARTING PROCEDURE

LOAD PROGRAM INTO MEMORY USING ABS LOADER  
LOAD ADDRESS 200  
START.

THE PROGRAM WILL LOOP AND RING BELL ON COMPLETION.

4.0 SWITCH SETTINGS

5.0 SUBROUTINE ABSTRACTS

5.1 HLT

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

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5.2 SCOPE

THE SCOPE (EMT) SERVICE ROUTINE STORES IN R1 THE PC OF THE LAST TEST SUCCESSFULLY EXECUTED AND MAY BE USED AS AN AID IN DEBUGGING IF THE PROGRAM 'BOMBS' BECAUSE OF A HARDWARE FAILURE. A BRANCH INSTRUCTION MAY BE INSERTED AT THE SCOPE LOCATION TO THE PREVIOUS SCOPE (EMT) INSTRUCTION TO 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. ALL TESTS MAY BE RESTARTED AT THE PREVIOUS SCOPE.

6.0 ERRORS

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

6.1 ERROR RECOVERY

PRESS CONTINUE OR RESTART AT 200 OR PREVIOUS SCOPE.

6.2 ERROR LOOPING

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

6.3 MEMORY MANAGEMENT ABORT ERRORS

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

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7.0 RESTRICTIONS

7.1 STARTING RESTRICTION

NONE

7.2 OPERATIONAL RESTRICTION

NONE

8.0 MISCELLANEOUS

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

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

- 1) KU14:
- 2) UUI7:

DENOTE:

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

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

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8.2 STACK POINTER

THE STACK POINTERS ARE INITIALLY SET TO THE FOLLOWING VALUES

KERNEL = 1060  
USER = 600

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

8.3 PASS COUNT

1000(8) PASSES ARE REQUIRED FOR COMPLETION OF THIS PROGRAM; AT WHICH TIME THE BELL WILL RING AT THE TTY.

8.4 DEBUGGING TIPS

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

8.5 MEMORY MANAGEMENT MEMORY MAP

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

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000250  
  
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177774  
177560  
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177564  
177566  
177570

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.ABS  
.LIST ME  
.TITLE DFKTCA-A  
;SEGMENTATION TEST. THIS TEST TESTS THE MTPI & MFPI INSTRUCTIONS.  
;GENERAL REGISTER ASSIGNMENTS  
R0=%0  
R1=%1  
R2=%2  
R3=%3  
R4=%4  
R5=%5  
PC=%7  
;STACK POINTER REGISTERS  
KSP=%6 ;KERNEL STACK POINTER  
USP=%6 ;USER STACK POINTER  
;STATUS REGISTER BIT ASSIGNMENTS  
C=1 ;CARRY BIT  
Z=4 ;ZERO BIT  
N=10 ;NEGATIVE BIT  
PRTY7=340 ;PRIORITY LEVEL 7  
PRTY4=200 ;PRIORITY LEVEL 4  
KM=000000 ;KERNEL MODE  
UM=140000 ;USER MODE  
PUM=030000 ;PREVIOUS USER MODE  
;VECTOR ADDRESSES  
ERRVEC=10 ;ADDRESS OF ERROR VECTOR  
PFVEC=24 ;ADDRESS OF POWER FAIL TRAP VECTOR  
EMTVEC=30 ;ADDRESS OF EMT VECTOR  
MMVEC=250 ;ADDRESS OF MNGT ERROR TRAP VECTOR  
;REGISTER ADDRESSES  
PSW=177776 ;ADDRESS OF STATUS REGISTER  
SLR=177774 ;ADDRESS OF STACK LIMIT REGISTER  
TKS=177560 ;ADDRESS OF KEYBOARD CSR  
TKB=177562 ;ADDRESS OF KEYBOARD BUFFER  
TPS=177564 ;ADDRESS OF TELEPRINTER CSR  
TPB=177566 ;ADDRESS OF TELEPRINTER BUFFER  
DISPLAY=177570 ;ADDRESS OF CONSOL DISPLAY REGISTER
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177652  
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177656

172300  
172302  
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; INITIAL STACK POINTER SETTINGS

KPTR=1060  
UPTR=600

; BOTTOM OF KERNEL STACK  
; USER STACK SETTING

; \*\*\*\*\*NOTE\*\*\*\*\*  
; THE KERNEL & USER STACK POINTER ARE AT PHYSICAL 1060 & 0600  
; \*\*\*\*\*

; MGMTMENTATION REGISTER ADDRESS ASSIGNMENTS

SR0=177572  
SR1=177574  
SR2=177576

; ADDRESS OF SEGMENTATION REGISTER SR0  
; " " " " SR1  
; " " " " SR2

; USER PDR'S

UPDR0=177600  
UPDR1=177602  
UPDR2=177604  
UPDR3=177606  
UPDR4=177610  
UPDR5=177612  
UPDR6=177614  
UPDR7=177616

; USER PAR'S

UPAR0=177640  
UPAR1=177642  
UPAR2=177644  
UPAR3=177646  
UPAR4=177650  
UPAR5=177652  
UPAR6=177654  
UPAR7=177656

; KERNEL PDR'S

KPDR0=172300  
KPDR1=172302  
KPDR2=172304  
KPDR3=172306  
KPDR4=172310  
KPDR5=172312  
KPDR6=172314  
KPDR7=172316

; KERNEL PAR'S

KPAR0=172340  
KPAR1=172342  
KPAR2=172344  
KPAR3=172346  
KPAR4=172350  
KPAR5=172352  
KPAR6=172354  
KPAR7=172356



DFKTCA-A  
DFKTCA.P11

MACY11 27(732) 20-SEP-76 10:49 PAGE 9

```
298  
299  
300          000006      ;ACCESS CONTROL FIELD DEFINITIONS (IN PDR)  
301                                     RW=6          ;READ & WRITE  
302  
303          000000      ;INSTUCTION EQUATES  
304          104000      HLT=HALT  
305                                     SCOPE=EMT          ;SCOPE IS AN EMT TRAP INST.  
306  
307          000000      . = 0  
308          000000      000002      . +2  
309          000002      000000      HALT  
310          000004      000006      . +2  
311          000006      000000      HALT  
312          000010      000012      . +2  
313          000012      000000      HALT  
314          000014      000016      . +2  
315          000016      000000      HALT  
316          000020      000022      . +2  
317          000022      000000      HALT  
318          000024      000026      . +2  
319          000026      000000      HALT  
320          000030      000032      . +2  
321          000032      000000      HALT  
322          000034      000036      . +2  
323          000036      000000      HALT  
324          000040      000042      . +2  
325          000042      000000      HALT  
326          000044      000046      . +2  
327          000046      000000      HALT  
328          000050      000052      . +2  
329          000052      000000      HALT  
330          000054      000056      . +2  
331          000056      000000      HALT  
332          000060      000062      . +2  
333          000062      000000      HALT  
334          000064      000066      . +2  
335          000066      000000      HALT  
336          000070      000072      . +2  
337          000072      000000      HALT  
338          000074      000076      . +2  
339          000076      000000      HALT  
340          000100      000102      . +2  
341          000102      000000      HALT  
342          000104      000106      . +2  
343          000106      000000      HALT  
344          000110      000112      . +2  
345          000112      000000      HALT  
346          000114      000116      . +2  
347          000116      000000      HALT  
348          000120      000122      . +2  
349          000122      000000      HALT  
350          000124      000126      . +2  
351          000126      000000      HALT  
352          000130      000132      . +2  
353          000132      000000      HALT
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354	000134	000136	.+2
355	000136	000000	HALT
356	000140	000142	.+2
357	000142	000000	HALT
358	000144	000146	.+2
359	000146	000000	HALT
360	000150	000152	.+2
361	000152	000000	HALT
362	000154	000156	.+2
363	000156	000000	HALT
364	000160	000162	.+2
365	000162	000000	HALT
366	000164	000166	.+2
367	000166	000000	HALT
368	000170	000172	.+2
369	000172	000000	HALT
370	000174	000176	.+2
371	000176	000000	HALT
372	000200	000202	.+2
373	000202	000000	HALT
374	000204	000206	.+2
375	000206	000000	HALT
376	000210	000212	.+2
377	000212	000000	HALT
378	000214	000216	.+2
379	000216	000000	HALT
380	000220	000222	.+2
381	000222	000000	HALT
382	000224	000226	.+2
383	000226	000000	HALT
384	000230	000232	.+2
385	000232	000000	HALT
386	000234	000236	.+2
387	000236	000000	HALT
388	000240	000242	.+2
389	000242	000000	HALT
390	000244	000246	.+2
391	000246	000000	HALT
392	000250	000252	.+2
393	000252	000000	HALT
394	000254	000256	.+2
395	000256	000000	HALT
396	000260	000262	.+2
397	000262	000000	HALT
398	000264	000266	.+2
399	000266	000000	HALT
400	000270	000272	.+2
401	000272	000000	HALT
402	000274	000276	.+2
403	000276	000000	HALT
404	000300	000302	.+2
405	000302	000000	HALT
406	000304	000306	.+2
407	000306	000000	HALT
408	000310	000312	.+2
409	000312	000000	HALT

410	000314	000316	.+2	
411	000316	000000	HALT	
412	000320	000322	.+2	
413	000322	000000	HALT	
414	000324	000326	.+2	
415	000326	000000	HALT	
416	000330	000332	.+2	
417	000332	000000	HALT	
418	000334	000336	.+2	
419	000336	000000	HALT	
420	000340	000342	.+2	
421	000342	000000	HALT	
422	000344	000346	.+2	
423	000346	000000	HALT	
424	000350	000352	.+2	
425	000352	000000	HALT	
426	000354	000356	.+2	
427	000356	000000	HALT	
428	000360	000362	.+2	
429	000362	000000	HALT	
430	000364	000366	.+2	
431	000366	000000	HALT	
432	000370	000372	.+2	
433	000372	000000	HALT	
434	000374	000376	.+2	
435	000376	000000	HALT	
436				
437		000010	.=ERRVEC	
438	000010	000400	.WORD SHLT	;SET USER HALT TRAP
439		000030	.=EMTVEC	
440	000030	000432	.WORD SCOPEA	;SET SCOPE (EMT) TRAP VECTOR
441		000250	.=MMVEC	
442	000250	000462	.WORD MMERR	;SET SEG. ERROR TRAP VECTOR
443				
444		000046	.=46	
445	000046	007552	LOGIC	
446		000052	.=52	
447	000052	000000	0	
448				
449			.NLIST MC	
450		000200	.=200	
451	000200	000167 000664	JMP START	;GO START TEST

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456 000400 162716 000002          . =400
457 000404 005776 000000          :USER HALT TRAP SERVICE ROUTINE.
458 000410 001404
459 000412 062716 000002          SHLT:  SUB  #2,(KSP)      ;ADJUST PC
460 000416 000167 177364          TST  @2(KSP)      ;CHECK IF HLT CAUSED TRAP
461 000422 042766 140000 000002  SHLT:  BEQ  SHLTA
462 000430 000002          ADD  #2,(KSP)      ;RESTORE PC
463
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466 000432 011601
467 000434 012706 001060          SHLTA: JMP  6      ;GO HALT AT 6
468 000440 005046          BIC  #UM,2(KSP)   ;KERNEL MODE ON RETURN
469 000442 010146
470 000444 012746 000600          RTI
471 000450 012737 030000 177776
472 000456 006606
473 000460 000002          ;SCOPE (EMT) SERVICE ROUTINE
474
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476 000462 013767 177572 000312  SCOPE: MOV  (KSP),R1      ;SAVE RETURN ADDRESS IN R1
477 000470 005037 177572          MOV  #KPTR,KSP    ;SET KERNEL STACK PTR
478 000474 000137 000252          CLR  -(KSP)
479
480
481
482 001000 000000          MOV  R1,-(KSP)
483 001002 000000          MOV  #UPTR,-(KSP)
484 001004 000000          MOV  #PUM,@#PSW   ;PREVIOUS USER MODE
485 001014 001014          MTP  USP          ;SET USER STACK PTR
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489      001070
490
491      001070 000240
492      001072 005067 177702
493      001076 005037 177776
494      001102 012706 001060
495      001106 104000
496      001110 012737 000462 000250
497      001116 005037 000252
498      001122 000240
499      001124 005037 177572
500      001130 012702 177600
501      001134 012703 000010
502      001140 005022
503      001142 077302
504      001144 012702 177640
505      001150 012703 000010
506      001154 005022
507      001156 077302
508      001160 012702 172300
509      001164 012703 000010
510      001170 005022
511      001172 077302
512      001174 012702 172340
513      001200 012703 000010
514      001204 005022
515      001206 077302
516      001210 012767 073006 171062
517      001216 012767 000006 171070
518      001224 012767 077406 171064
519      001232 012767 000006 176350
520      001240 012767 000006 176344
521      001246 005067 171066
522      001252 012767 000167 171074
523      001260 012767 007600 171070
524      001266 012767 000173 176354
525      001274 012767 000172 176350

```

```

      =1070
:START SEGMENTATION TEST-S5
START:  NOP
      CLR      ICNT
      CLR      @#PSW
      MOV      @#KPTR,KSP
      SCOPE
      MOV      @#MMERR,@#MMVEC
      CLR      @#MMVEC+2
      NOP
      CLR      @#SR0
      MOV      @#UPDR0,R2
      MOV      @#10,R3
      CLR      (R2)+
      SOB      R3,-2
      MOV      @#UPAR0,R2
      MOV      @#10,R3
      CLR      (R2)+
      SOB      R3,-2
      MOV      @#KPDR0,R2
      MOV      @#10,R3
      CLR      (R2)+
      SOB      R3,-2
      MOV      @#KPAR0,R2
      MOV      @#10,R3
      CLR      (R2)+
      SOB      R3,-2
      MOV      @#73006,KPDR0
      MOV      @#6,KPDR6
      MOV      @#77406,KPDR7
      MOV      @#6,UPDR4
      MOV      @#6,UPDR5
      CLR      KPAR0
      MOV      @#167,KPAR6
      MOV      @#7600,KPAR7
      MOV      @#173,UPAR4
      MOV      @#172,UPARS

```

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: CLEAR PASS COUNT
: KERNEL MODE!!! PREV KERNEL MODE!!
: SET KERNEL STACK PTR
: SCOPE SETS UP ALL STACK PTRS
: KERNEL MODE ON SEG ABORT
: CLEAR MEMORY MANAGEMENT REGISTERS

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: RW,UP 167 BLOCKS
: RW,UP 1 BLOCK
: RW,UP 200 BLOCKS
: RW,UP 1 BLOCK
: RW,UP 1 BLOCK
: VA=PA=0000-12077
: VA=140000-140077;PA=16700-16777
: VA=160000-177776;PA=760000-777776
: VA=100000-100077;PA=17300-17377
: VA=120000-120077;PA=17400-17277

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526  
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530 016600  
531 016600  
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534 001302 005016  
535 001304 012702 177777  
536 001310 005237 177572  
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538 001314 006602  
539 001316 016703 176454  
540 001322 005037 177572  
541 001326 022706 001062  
542 001332 001401  
543 001334 000000  
544 001336 122703 000004  
545 001342 001401  
546 001344 000000  
547 001346 005702  
548 001350 001401  
549 001352 000000  
550 001354 104000  
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557 001356 005016  
558 001360 012702 016600  
559 001364 012737 177777 016600  
560 001372 005237 177572  
561  
562 001376 000277  
563 001400 006612  
564 001402 016703 176370  
565 001406 005037 177572  
566 001412 022706 001062  
567 001416 001401  
568 001420 000000  
569 001424 122703 000005  
570 001428 001401  
571 001432 000000  
572 001436 005737 016600  
573 001440 000000  
574 001444 000000  
575 001448 000000  
576 001452 000000  
577 001456 000000  
578 001460 000000  
579 001464 000000  
580 001468 000000  
581 001472 000000  
582 001476 000000  
583 001480 000000  
584 001484 000000  
585 001488 000000  
586 001492 000000  
587 001496 000000  
588 001500 000000  
589 001504 000000  
590 001508 000000  
591 001512 000000  
592 001516 000000  
593 001520 000000  
594 001524 000000  
595 001528 000000  
596 001532 000000  
597 001536 000000  
598 001540 000000  
599 001544 000000  
600 001548 000000

; TESTS KKO-KK16 TEST THE MTP1 INSTRUCTION KERNEL MODE, PREV KERNEL MODE.  
; \*\*\*\*\*  
; VIRT=16600 ; KERNEL VIRTUAL ADDRESS FOR THESE TESTS  
; PHYS=16600 ; CORRESPONDING KERNEL PHYSICAL ADDRESS  
; \*\*\*\*\*

; TEST THAT MTP1 CAN LOAD A GENERAL REGISTER (R2)  
CLR (KSP) ; PUT 0 ON KERNEL STACK  
MOV #1, R2 ; PRESET REGISTER  
INC #SR0 ; ENABLE MEMORY MANAG.

KKO: MTP1 R2 ; R2+(KSP)+  
MOV PSW, R3 ; SAVE STATUS RESULT  
CLR #SR0 ; DISABLE MEMORY MANAG.  
CMP #KPTR+2, KSP ; CHECK THAT STACK POPPED  
BEQ .+4  
HLT ; ERROR! INCORRECT STACK PTR  
CMPB #Z, R3 ; CHECK STATUS RESULT  
BEQ .+4  
HLT ; ERROR! INCORRECT STATUS RESULT  
TST R2 ; CHECK RESULT  
BEQ .+4  
HLT ; ERROR! INCORRECT RESULT  
SCOPE

; TEST THAT MTP1 CAN LOAD KERNEL ADDRESS (VIRT)  
; DM=1

CLR (KSP) ; PUT 0 ON KERNEL STACK  
MOV #VIRT, R2 ; R2=VIRT ADDRESS  
MOV #1, #SR0 ; PRESET DATA  
INC #SR0 ; ENABLE MEMORY MANAG.

KK1: SCC  
MTP1 (R2) ; VIRT+(KSP)+  
MOV PSW, R3 ; SAVE STATUS RESULT  
CLR #SR0 ; DISABLE MEMORY MANAG.  
CMP #KPTR+2, KSP ; CHECK THAT STACK POPPED  
BEQ .+4  
HLT ; ERROR! INCORRECT STACK PTR  
CMPB #Z+C, R3 ; CHECK STATUS RESULT  
BEQ .+4  
HLT ; ERROR! INCORRECT STATUS RESULT  
TST #SR0 ; CHECK RESULT  
BEQ .+4  
HLT ; ERROR! INCORRECT RESULT  
SCOPE

Kernel Mode!!! Prev Kernel Mode  
; PUT 0 ON KERNEL STACK  
; R2=VIRT ADDRESS  
; PRESET DATA  
; ENABLE MEMORY MANAG.

582									
583	001472	006622							
584	001474	005037	177572						
585	001500	005237	016600						
586	001504	001401							
587	001506	000000							
588	001510	022702	016602						
589	001514	001401							
590	001516	000000							
591	001520	005067	176252						
592	001524	104000							
593									
594	001526	012716	177777						
595	001532	012702	001004						
596	001536	012737	016604	001004					
597	001544	005037	016604						
598	001550	005237	177572						
599									
600	001554	006632							
601	001556	005037	177572						
602	001562	005237	016604						
603	001566	001401							
604	001570	000000							
605	001572	104000							
606									
607									
608	001574	005016							
609	001576	012704	016602						
610	001602	012737	177777	016600					
611	001610	005237	177572						
612									
613	001614	006644							
614	001616	005037	177572						
615	001622	022704	016600						
616	001626	001401							
617	001630	000000							
618	001632	005737	016600						
619	001636	001401							
620	001640	000000							
621	001642	104000							
622									
623									
624	001644	012737	000000	177776					
625	001652	012716	177777						
626	001656	012702	001010						
627	001662	012767	016600	177116					
628	001670	005037	016600						
629	001674	005237	177572						
630									
631	001700	006652							
632	001702	005037	177572						
633	001706	005237	016600						
634	001712	001401							
635	001714	000000							
636	001716	005067	176054						
637	001722	104000							

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638
639
640 001724 012737 000000 177776 ;DM=6      MOV      #0, @PSW      ;KERNEL MODE!!!, PREV KERNEL MODE
641 001732 005016                CLR      (KSP)        ;PUT 0 ON KERNEL STACK
642 001734 012702 000002                MOV      #2, R2      ;LOAD INDEX REGISTER
643 001740 012767 177777 014634      MOV      #-1, PHYS+2  ;PRESET DATA
644 001746 005237 177572                INC      @SRO        ;ENABLE MEMORY MANAG.
645
646 001752 006662 016600      KK6:      MTP1      VIRT(R2)      ;VIRT+2+(KSP)+
647 001756 016700 176014      MOV      PSW, R0     ;SAVE STATUS RESULT
648 001762 005037 177572      CLR      @SRO        ;DISABLE MEMORY MANAG.
649 001766 022706 001062      CMP      @KPTR+2, KSP ;CHECK THAT STACK POINTER POPPED
650 001772 001401                BEQ      .+4
651 001774 000000                HLT
652 001776 122700 000004      CMPB    #Z, R0      ;CHECK STATUS RESULT
653 002002 001401                BEQ      .+4
654 002004 000000                HLT      ;ERROR! INCORRECT STACK PTR
655 002006 005737 016602      TST     @PHYS+2     ;CHECK RESULT
656 002012 001401                BEQ      .+4
657 002014 000000                HLT      ;ERROR! INCORRECT RESULT
658 002016 104000      SCOPE
659
660                ;DM=7
661 002020 012716 177777                MOV      #-1, (KSP)  ;PUT #-1 ON KERNEL STACK
662 002024 012702 000002                MOV      #2, R2      ;LOAD INDEX REGISTER
663 002030 012737 016600 001010      MOV      @VIRT, @TEMP+4 ;LOAD ADDRESS
664 002036 005037 016600      CLR      @PHYS      ;PRESET DATA
665 002042 005237 177572      INC      @SRO        ;ENABLE MEMORY MANAG.
666
667 002046 006672 001006      KK7:      MTP1      @TEMP+2(R2) ;VIRT+(KSP)+
668 002052 005037 177572      CLR      @SRO        ;DISABLE MEMORY MANAG.
669 002056 005237 016600      INC      @PHYS      ;CHECK RESULT
670 002062 001401                BEQ      .+4
671 002064 000000                HLT      ;ERROR! INCORRECT RESULT
672 002066 104000      SCOPE
673
674                ;TEST THAT MTP1 CAN LOAD KERNEL
675                ;DM=1, PC
676 002070 012716 000403      KK10B:  MOV      #403, (KSP) ;PUT BR .+10 INST AS DATA ON STACK
677 002074 005037 002106      CLR      @KK10A ;PUT HALT FOLLOWING MTP1
678 002100 005237 177572      INC      @SRO        ;ENABLE MEMORY MANAG.
679
680 002104 006617      KK10:   MTP1      (PC)      ;KK10A+(KSP)+
681 002106 000000      KK10A:  HALT          ;ERROR! MTP1 DID NOT POP BR .+10
682                ;INTO KK10A
683 002110 005037 177572                CLR      @SRO        ;DISABLE MEMORY MANAG.
684 002114 000765                BR       KK10B       ;LOOP TEST IF ERROR
685 002116 005037 177572                CLR      @SRO        ;DISABLE MEMORY MANAG.
686 002122 104000      SCOPE
687
688                ;DM=2, PC
689 002124 012716 177777                MOV      #-1, (KSP)  ;PUT #-1 ON KERNEL STACK
690 002130 005057 000006                CLR      KK11A
691 002134 005237 177572                INC      @SRO        ;ENABLE MEMORY MANAG.
692
693 002140 006627      KK11:   MTP1      (PC)+  ;(PC)++(KSP)+

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Address	OpCode	Operand 1	Operand 2	Operand 3	Comments
750	002370	104000			SCOPE
751					;DM=7,PC
752					
753	002372	005037	177776		CLR @PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
754	002376	012716	177777		MOV @-1,(KSP) ;PUT @-1 ON KERNEL STACK
755	002402	012737	016604	001004	MOV @VIRT+4,@TEMP ;LOAD ADDRESS
756	002410	005037	016604		CLR @PHYS+4 ;PRESET DATA
757	002414	005237	177572		INC @SR0 ;ENABLE MEMORY MANAG.
758					
759					
760	002420	006677	176360		KK15: MTP1 @TEMP ;VIRT+4+(KSP)+
761	002424	005037	177572		CLR @SR0 ;DISABLE MEMORY MANAG.
762	002430	005237	016604		INC @PHYS+4 ;CHECK RESULT
763	002434	001401			BEQ .+4
764	002436	000000			HLT ;ERROR INCORRECT RESULT
765	002440	104000			SCOPE
766					
767					
768					;CHECK THAT MTP1 CAN SET STACK PTR
769	002442	012737	000000	177776	MOV @0,@PSW ;KERNEL MODE!!!,PREV KERNEL MODE
770	002450	005016			CLR (KSP) ;PUT 0 ON KERNEL STACK
771	002452	005237	177572		INC @SR0 ;ENABLE MEMORY MANAG.
772					
773	002456	006606			KK16: MTP1 KSP ;KSP+(KSP)+
774	002460	005037	177572		CLR @SR0 ;DISABLE MEMORY MANAG.
775	002464	005706			TST KSP ;CHECK STACK PTR
776	002466	001401			BEQ .+4
777	002470	000000			HLT ;ERROR!
778	002472	012706	001060		MOV @KPTR,KSP ;SET KERNEL STACK PTR
779	002476	104000			SCOPE
780					
781					;TESTS KU0-KU16 TEST THE MTP1 INSTRUCTION KERNEL MODE, PREV USER MODE.
782					;TEST THAT MTP1 CAN LOAD A GENERAL REGISTER (R2)
783	002500	012737	030340	177776	MOV @PUM+PTY7,@PSW ;KERNEL MODE!!!,PREV USER MODE!!
784	002506	005016			CLR (KSP) ;PUT 0 ON KERNEL STACK
785	002510	012702	177777		MOV @-1,R2 ;PRESET REGISTER
786	002514	005237	177572		INC @SR0 ;ENABLE MEMORY MANAG.
787					
788	002520	006602			KU0: MTP1 R2 ;R2+(KSP)+
789	002522	016703	175250		MOV PSW,R3 ;SAVE STATUS RESULT
790	002526	005037	177572		CLR @SR0 ;DISABLE MEMORY MANAG.
791	002532	022706	001062		CMP @KPTR+2,KSP ;CHECK THAT STACK POPPED
792	002536	001401			BEQ .+4
793	002540	000000			HLT ;ERROR! INCORRECT STACK PTR
794	002542	122703	000344		CMPEB @PTY7+Z,R3 ;CHECK STATUS RESULT
795	002546	001401			BEQ .+4
796	002550	000000			HLT ;ERROR! INCORRECT STATUS RESULT
797	002552	005702			TST R2 ;CHECK RESULT
798	002554	001401			BEQ .+4
799	002556	000000			HLT ;ERROR! INCORRECT RESULT
800	002560	104000			SCOPE
801					;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS KERNEL MODE.
802					;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R3)
803	002562	012767	000340	175206	MOV @PTY7,PSW ;KERNEL MODE!!!,PREV KERNEL MODE!!
804	002570	005066	177776		CLR -2(KSP)
805	002574	012703	177777		MOV @-1,R3 ;PRESET GENERAL REGISTER

806	002600	005237	177572		INC	2#SRO	ENABLE MEMORY MANAGEMENT
807	002604	006503		KKF0:	MFPI	R3	-(KSP)+R3
808	002606	016702	175164		MOV	PSW,R2	SAVE CC'S
809	002612	005037	177572		CLR	2#SRO	DISABLE MEMORY MANAGEMENT
810	002616	122702	000350		CMPB	#PTY7+N,R2	CHECK CC'S
811	002622	001401			BEQ	.+4	
812	002624	000000			HLT		ERROR! INCORRECT CC'S AFTER MFPI
813	002626	022706	001056		CMP	#KPTR-2,KSP	CHECK THAT STACK WAS PUSHED
814	002632	001401			BEQ	.+4	
815	002634	000000			HLT		ERROR! INCORRECT STACK PTR
816	002636	005216			INC	(KSP)	CHECK RESULT
817	002640	001401			BEQ	.+4	
818	002642	000000			HLT		ERROR! INCORRECT RESULT
819	002644	104000			SCOPE		
820							
821							
822							
823	002646	005067	175124		CLR	PSW	KERNEL MODE!!!,PREV KERNEL MODE!!
824	002652	005066	177776		CLR	-2(KSP)	
825	002656	012702	016600		MOV	#VIRT,R2	R2=VIRTUAL ADDRESS
826	002662	012737	177777	016600	MOV	#-1,#PHYS	PRESET PHYSICAL ADDRESS
827	002670	005237	177572		INC	2#SRO	ENABLE MEMORY MANAGEMENT
828	002674	000277			SCC		PRESET CC'S
829	002676	006512		KKF1:	MFPI	(R2)	-(KSP)+(R2)
830	002700	016703	175072		MOV	PSW,R3	SAVE CC'S
831	002704	005037	177572		CLR	2#SRO	DISABLE MEMORY MANAGEMENT
832	002710	122703	000011		CMPB	#N+C,R3	CHECK CC'S
833	002714	001401			BEQ	.+4	
834	002716	000000			HLT		ERROR! INCORRECT CC'S
835	002720	022706	001056		CMP	#KPTR-2,KSP	CHECK THAT STACK WAS PUSHED
836	002724	001401			BEQ	.+4	
837	002726	000000			HLT		ERROR! INCORRECT STACK PTR
838	002730	005216			INC	(KSP)	CHECK RESULT
839	002732	001401			BEQ	.+4	
840	002734	000000			HLT		ERROR! INCORRECT RESULT
841	002736	104000			SCOPE		
842							
843							
844	002740	012767	000000	175030	MOV	#0,PSW	KERNEL MODE!!!,PREV KERNEL MODE!!
845	002746	012766	177777	177776	MOV	#-1,-2(KSP)	
846	002754	012702	016600		MOV	#VIRT,R2	R2=VIRTUAL ADDRESS
847	002760	005037	016600		CLR	2#PHYS	PRESET PHYSICAL ADDRESS
848	002764	005237	177572		INC	2#SRO	ENABLE MEMORY MANAGEMENT
849	002770	006522		KKF2:	MFPI	(R2)+	-(KSP)+VIRT
850	002772	005037	177572		CLR	2#SRO	DISABLE MEMORY MANAGEMENT
851	002776	005716			TST	(KSP)	CHECK RESULT
852	003000	001401			BEQ	.+4	
853	003002	000000			HLT		ERROR! INCORRECT RESULT ON STACK
854	003004	022702	016602		CMP	#VIRT+2,R2	CHECK AUTO INCREMENT
855	003010	001401			BEQ	.+4	
856	003012	000000			HLT		ERROR! AUTO INCREMENT FAILED
857	003014	005067	174756		CLR	PSW	
858	003020	104000			SCOPE		
859							
860							
861	003022	005067	174750		CLR	PSW	KERNEL MODE!!!,PREV KERNEL MODE!!

862	003026	005066	177776		CLR	-2(KSP)	
863	003032	012702	001004		MOV	#TEMP,R2	;LOAD INDIRECT ADDRESS
864	003036	012737	016602	001004	MOV	#VIRT+2,#TEMP	;LOAD ADDRESS
865	003044	012737	177777	016602	MOV	#-1,#PHYS+2	;PRESET DATA
866	003052	005237	177572		INC	#SRO	;ENABLE MEMORY MANAGEMENT
867	003056	006532			MFPI	#(R2)+	;-(KSP)+VIRT+2
868	003060	005037	177572		CLR	#SRO	;DISABLE MEMORY MANAGEMENT
869	003064	005216			INC	(KSP)	;CHECK RESULT
870	003066	001401			BEQ	.+4	
871	003070	000000			HLT		;ERROR! INCORRECT RESULT
872	003072	104000			SCOPE		
873							
874							
875	003074	005067	174676		CLR	PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
876	003100	012766	177777	177776	MOV	#-1,-2(KSP)	
877	003106	012704	016602		MOV	#VIRT+2,R4	;R4=VIRTUAL ADDRESS+2
878	003112	005037	016600		CLR	#PHYS	;PRESET PHYSICAL ADDRESS DATA
879	003116	005237	177572		INC	#SRO	;ENABLE MEMORY MANAGEMENT
880	003122	006544			MFPI	-(R4)	;-(KSP)+VIRT
881	003124	005037	177572		CLR	#SRO	;DISABLE MEMORY MANAGEMENT
882	003130	022704	016600		CMP	#VIRT,R4	;CHECK AUTO-DECREMENT
883	003134	001401			BEQ	.+4	
884	003136	000000			HLT		;ERROR! AUTO-DECREMENT FAILED
885	003140	005716			TST	(KSP)	;CHECK RESULT
886	003142	001401			BEQ	.+4	
887	003144	000000			HLT		;ERROR! INCORRECT RESULT
888	003146	104000			SCOPE		
889							
890							
891	003150	012767	000000	174620	MOV	#0,PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
892	003156	005066	177776		CLR	-2(KSP)	
893	003162	012700	001006		MOV	#TEMP+2,R0	;R1=INDIRECT ADDRESS
894	003166	012737	016604	001004	MOV	#VIRT+4,#TEMP	;LOAD ADDRESS
895	003174	012737	177777	016604	MOV	#-1,#PHYS+4	;PRESET PHYSICAL ADDRESS DATA
896	003202	005237	177572		INC	#SRO	;ENABLE MEMORY MANAGEMENT
897	003206	006550			MFPI	-(R0)	;-(KSP)+VIRT+4
898	003210	005037	177572		CLR	#SRO	;DISABLE MEMORY MANAGEMENT
899	003214	005216			INC	(KSP)	;CHECK RESULT
900	003216	001401			BEQ	.+4	
901	003220	000000			HLT		
902	003222	005067	174550		CLR	PSW	
903	003226	104000			SCOPE		
904							
905							
906	003230	012767	000000	174540	MOV	#0,PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
907	003236	012766	177777	177776	MOV	#-1,-2(KSP)	
908	003244	012702	000002		MOV	#2,R2	;LOAD INDEX REGISTER
909	003250	005037	016602		CLR	#PHYS+2	;PRESET PHYSICAL ADDRESS DATA
910	003254	005237	177572		INC	#SRO	;ENABLE MEMORY MANAGEMENT
911	003260	006562	016600		MFPI	VIRT(R2)	;-(KSP)+VIRT-2
912	003264	005037	177572		CLR	#SRO	;DISABLE MEMORY MANAGEMENT
913	003270	022706	001056		CMP	#KPTR-2,KSP	;CHECK STACK PTR
914	003274	001401			BEQ	.+4	
915	003276	000000			HLT		;ERROR! INCORRECT STACK PTR
916	003300	005716			TST	(KSP)	;CHECK RESULT
917	003302	001401			BEQ	.+4	

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918 003304 000000          HLT          ;ERROR! INCORRECT RESULT
919 003306 005067 174464  CLR          PSW
920 003312 104000          SCOPE
921
922          ;DM=7
923 003314 005067 174456  CLR          PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
924 003320 005066 177776  CLR          -2(KSP)
925 003324 012702 177774  MOV          #4,R2          ;LOAD INDEX REGISTER
926 003330 012737 016600 001004  MOV          @VIRT,@TEMP    ;LOAD ADDRESS
927 003336 012737 177777 016600  MOV          #-1,@PHYS     ;CLEAR PHYSICAL ADDRESS DATA
928 003344 005237 177572          INC          @SR0          ;ENABLE MEMORY MANAGEMENT
929 003350 006572 001010  KKF7:      MFPI         @TEMP+4(R2)    ;-(KSP)+VIRT
930 003354 005037 177572          CLR          @SR0          ;DISABLE MEMORY MANAGEMENT
931 003360 005216          INC          (KSP)         ;CHECK RESULT
932 003362 001401          BEQ         .+4
933 003364 000000          HLT
934 003366 104000          SCOPE          ;ERROR! INCORRECT RESULT
935
936          ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
937          ;DM=0,PC
938 003370 005067 174402  CLR          PSW          ;KERNEL MODE!!!,PREV KERNEL MODE!!
939 003374 012706 001060  MOV          #KPTR,KSP     ;SET KERNEL STACK PTR
940 003400 005066 177776  CLR          -2(KSP)
941 003404 005237 177572  INC          @SR0          ;ENABLE MEMORY MANAGEMENT
942 003410 000277          SCC
943 003412 006507  KKF10:    MFPI         PC          ;-(KSP)+PC
944 003414 016702 174356  MOV          PSW,R2        ;SAVE CC'S
945 003420 005037 177572  CLR          @SR0          ;DISABLE MEMORY MANAGEMENT
946 003424 122702 000001  CMPB        #C,R2         ;CHECK CC'S
947 003430 001401          BEQ         .+4
948 003432 000000          HLT
949 003434 022706 001056  CMP          #KPTR-2,KSP   ;CHECK STACK PTR
950 003440 001401          BEQ         .+4
951 003442 000000          HLT          ;ERROR! STACK NOT PUSHED
952 003444 022716 003414  CMP          #KKF10+2,(KSP);CHECK THAT PS WAS PUSHED ON THE STACK
953 003450 001401          BEQ         .+4
954 003452 000000          HLT          ;ERROR! PC NOT PUSHED ON THE STACK
955 003454 104000          SCOPE
956
957
958          ;DM=3,PC
959
960 003456 012767 000000 174312  MOV          #0,PSW        ;KERNEL MODE!!!,PREV KERNEL MODE!!
961 003464 005066 177776          CLR          -2(KSP)
962 003470 012737 177777 016600  MOV          #-1,@PHYS
963 003476 005237 177572          INC          @SR0          ;ENABLE MEMORY MANAGEMENT
964 003502 006537 016600  KKF11:    MFPI         @VIRT    ;-(KSP)+VIRT
965 003506 005037 177572          CLR          @SR0          ;DISABLE MEMORY MANAGEMENT
966 003512 005216          INC          (KSP)         ;CHECK RESULT
967 003514 001401          BEQ         .+4
968 003516 000000          HLT          ;ERROR! INCORRECT RESULT
969 003520 104000          SCOPE
970
971          ;DM=6,PC
972 003522 012767 000340 174246  MOV          #PRTY7,PSW    ;KERNEL MODE!!!,PREV KERNEL MODE!!
973 003530 012766 177777 177776  MOV          #-1,-2(KSP)

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974 003536 005037 016600          CLR      @#PHYS      ;PRESET PHYSICAL ADDRESS DATA
975 003542 005237 177572          INC      @#SR0      ;ENABLE MEMORY MANAGEMENT
976 003546 006567 013026          KKF12: MFPI     VIRT      ;-(KSP)+VIRT
977 003552 005037 177572          CLR      @#SR0      ;DISABLE MEMORY MANAGEMENT
978 003556 005716          TST      (KSP)      ;CHECK RESULT
979 003560 001401          BEQ      .+4
980 003562 000000          HLT
981 003564 104000          SCOPE      ;ERROR! INCORRECT RESULT
982
983
984 003566 005067 174204          ;DM=7,PC          CLR      PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
985 003572 005066 177776          CLR      -2(KSP)
986 003576 012737 016604 001004          MOV      @VIRT+4,@#TEMP ;LOAD ADDRESS
987 003604 012737 177777 016604          MOV      @-1,@#PHYS+4 ;PRESET DATA
988 003612 005237 177572          INC      @#SR0      ;ENABLE MEMORY MANAGEMENT
989 003616 000277          SCC
990 003620 006577 175160          KKF13: MFPI     @TEMP      ;-(KSP)+VIRT+4
991 003624 016702 174146          MOV      PSW,R2      ;SAVE CC'S
992 003630 005037 177572          CLR      @#SR0      ;DISABLE MEMORY MANAGEMENT
993 003634 122702 000011          CMPB    @N+C,R2      ;CHECK CC'S
994 003640 001401          BEQ      .+4
995 003642 000000          HLT      ;ERROR! INCORRECT CC'S
996 003644 005216          INC      (KSP)      ;CHECK RESULT
997 003646 001401          BEQ      .+4
998 003650 000000          HLT      ;ERROR! INCORRECT RESULT ON STACK
999 003652 104000          SCOPE
1000
1001
1002 003654 012766 177777 177776          ;DM=1,PC          MOV      @-1,-2(KSP)
1003 003662 005237 177572          INC      @#SR0      ;ENABLE MEMORY MANAGEMENT
1004 003666 006517          KKF14: MFPI     (PC)      ;PUSH NEXT WORD ON THE STACK
1005 003670 000400          KKF14A: BR      +2      ;THIS DATA GOES ONTO THE STACK
1006 003672 005037 177572          CLR      @#SR0      ;DISABLE MEMORY MANAGEMENT
1007 003676 023716 003670          CMP      @#KKF14A,(KSP) ;CHECK DATA ON THE STACK
1008 003702 001401          BEQ      .+4
1009 003704 000000          HLT      ;ERROR! INCORRECT DATA ON STACK
1010 003706 104000          SCOPE
1011
1012
1013          ;TEST THAT KERNEL CAN LOAD USER ADDRESS (VIRT)
1014          ;DM=1
1015
1016          ;*****
1017          VIRT=120000      ;USER VIRTUAL ADDRESS FOR THESE TESTS
1018          PHYS=17200      ;CORRESPONDING PHYSICAL ADDRESS
1019          ;*****
1020
1021 003710 012737 030000 177776          MOV      @KH+PUM,@#PSW ;KERNEL MODE!!!,PREV USER MODE!!
1022 003716 005016          CLR      (KSP)      ;PUT 0 ON KERNEL STACK
1023 003720 012702 120000          MOV      @VIRT,R2      ;R2=VIRT ADDRESS
1024 003724 012737 177777 017200          MOV      @-1,@#PHYS      ;PRESET DATA
1025 003732 005237 177572          INC      @#SR0      ;ENABLE MEMORY MANAG.
1026
1027 003736 000277          SCC
1028 003740 006612          KU1:  MTPI     (R2)      ;VIRT+(KSP)+
1029 003742 016703 174030          MOV      PSW,R3      ;SAVE STATUS RESULT

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1030	003746	005037	177572		CLR	@#SRO	;	DISABLE MEMORY MANAG.
1031	003752	022706	001062		CMP	@KPTR+2, KSP	;	CHECK THAT STACK POPPED
1032	003756	001401			BEQ	+.4		
1033	003760	000000			HLT		;	ERROR! INCORRECT STACK PTR
1034	003762	122703	000005		CMPB	@Z+C, R3	;	CHECK STATUS RESULT
1035	003766	001401			BEQ	+.4		
1036	003770	000000			HLT		;	ERROR! INCORRECT STATUS RESULT
1037	003772	005737	017200		TST	@#PHYS	;	CHECK RESULT
1038	003776	001401			BEQ	+.4		
1039	004000	000000			HLT		;	ERROR! INCORRECT RESULT
1040	004002	104000			SCOPE			
1041								
1042								
1043	004004	012737	030000	177776	MOV	@PUM, @#PSW	;	KERNEL MODE!!!, PREV USER MODE!!
1044	004012	012716	177777		MOV	@-1, (KSP)	;	PUT @-1 ON KERNEL STACK
1045	004016	012702	120000		MOV	@VIRT, R2	;	R2=VIRT ADDRESS
1046	004022	005037	017200		CLR	@#PHYS	;	PRESET DATA
1047	004026	005237	177572		INC	@#SRO	;	ENABLE MEMORY MANAG.
1048								
1049	004032	006622			KU2: MTP	(R2)+	;	VIRT+(KSP)+
1050	004034	005037	177572		CLR	@#SRO	;	DISABLE MEMORY MANAG.
1051	004040	005237	017200		INC	@#PHYS	;	CHECK RESULT
1052	004044	001401			BEQ	+.4		
1053	004046	000000			HLT		;	ERROR! INCORRECT RESULT
1054	004050	022702	120002		CMP	@VIRT+2, R2	;	CHECK AUTO-INCREMENT
1055	004054	001401			BEQ	+.4		
1056	004056	000000			HLT		;	ERROR! AUTO-INCREMENT FAILED
1057	004060	005067	173712		CLR	PSW		
1058	004064	104000			SCOPE			
1059								
1060	004066	012737	030340	177776	MOV	@PUM+PRTY7, @#PSW	;	KERNEL MODE!!!, PREV USER MODE!!
1061	004074	012716	177777		MOV	@-1, (KSP)	;	PUT @-1 ON KERNEL STACK
1062	004100	012702	001004		MOV	@TEMP, R2	;	LOAD INDIRECT ADDRESS
1063	004104	012712	120004		MOV	@VIRT+4, (R2)	;	LOAD ADDRESS
1064	004110	005037	017204		CLR	@#PHYS+4	;	PRESET DATA
1065	004114	005237	177572		INC	@#SRO	;	ENABLE MEMORY MANAG.
1066								
1067	004120	006632			KU3: MTP	@(R2)+	;	VIRT+4+(KSP)+
1068	004122	005037	177572		CLR	@#SRO	;	DISABLE MEMORY MANAG.
1069	004126	005237	017204		INC	@#PHYS+4	;	CHECK RESULT
1070	004132	001401			BEQ	+.4		
1071	004134	000000			HLT		;	ERROR! INCORRECT RESULT
1072	004136	104000			SCOPE			
1073								
1074								
1075	004140	012737	030000	177776	MOV	@KM+PUM, @#PSW	;	KERNEL MODE!!!, PREV USER MODE!!
1076	004146	005016			CLR	(KSP)	;	PUT 0 ON KERNEL STACK
1077	004150	012704	120002		MOV	@VIRT+2, R4	;	LOAD ADDRESS
1078	004154	012737	177777	017200	MOV	@-1, @#PHYS	;	PRESET DATA
1079	004162	005237	177572		INC	@#SRO	;	ENABLE MEMORY MANAG.
1080								
1081	004166	006644			KU4: MTP	-(R4)	;	VIRT+(KSP)+
1082	004170	005037	177572		CLR	@#SRO	;	DISABLE MEMORY MANAG.
1083	004174	022704	120000		CMP	@VIRT, R4	;	CHECK AUTO-DECREMENT
1084	004200	001401			BEQ	+.4		
1085	004202	000000			HLT		;	ERROR! AUTO-DECREMENT FAILED

1086	004204	005737	017200		TST	@#PHYS	;CHECK RESULT
1087	004210	001401			BEQ	.+4	
1088	004212	000000			HLT		;ERROR! INCORRECT RESULT
1089	004214	104000			SCOPE		
1090							
1091							
1092	004216	012737	030000	177776	MOV	@#PUM, @#PSW	; KERNEL MODE!!!, PREV USER MODE!!
1093	004224	012716	177777		MOV	@-1, (KSP)	; PUT @-1 ON KERNEL STACK
1094	004230	012702	001010		MOV	@TEMP+4, R2	; LOAD INDIRECT ADDRESS
1095	004234	012767	120000	174544	MOV	@VIRT, TEMP+2	; LOAD ADDRESS
1096	004242	005037	017200		CLR	@#PHYS	; PRESET DATA
1097	004246	005237	177572		INC	@#SRO	; ENABLE MEMORY MANAG.
1098							
1099	004252	006652			KU5: MTP	@-(R2)	; VIRT+(KSP)+
1100	004254	005037	177572		CLR	@#SRO	; DISABLE MEMORY MANAG.
1101	004260	005237	017200		INC	@#PHYS	; CHECK RESULT
1102	004264	001401			BEQ	.+4	
1103	004266	000000			HLT		; ERROR! INCORRECT RESULT
1104	004270	005067	173502		CLR	PSW	
1105	004274	104000			SCOPE		
1106							
1107							
1108	004276	012737	030000	177776	MOV	@#PUM, @#PSW	; KERNEL MODE!!!, PREV USER MODE!!
1109	004304	005016			CLR	(KSP)	; PUT 0 ON KERNEL STACK
1110	004306	012702	000002		MOV	@2, R2	; LOAD INDEX REGISTER
1111	004312	012767	177777	012662	MOV	@-1, PHYS+2	; PRESET DATA
1112	004320	005237	177572		INC	@#SRO	; ENABLE MEMORY MANAG.
1113							
1114	004324	006662	120000		KU6: MTP	VIRT(R2)	; VIRT+2+(KSP)+
1115	004330	016700	173442		MOV	PSW, R0	; SAVE STATUS RESULT
1116	004334	005037	177572		CLR	@#SRO	; DISABLE MEMORY MANAG.
1117	004340	022706	001062		CMP	@KPTR+2, KSP	; CHECK THAT STACK POINTER POPPED
1118	004344	001401			BEQ	.+4	
1119	004346	000000			HLT		; ERROR! INCORRECT STACK PTR
1120	004350	122700	000004		CMPB	@Z, R0	; CHECK STATUS RESULT
1121	004354	001401			BEQ	.+4	
1122	004356	000000			HLT		; ERROR! INCORRECT STATUS RESULT
1123	004360	005737	017202		TST	@#PHYS+2	; CHECK RESULT
1124	004364	001401			BEQ	.+4	
1125	004366	000000			HLT		; ERROR! INCORRECT RESULT
1126	004370	104000			SCOPE		
1127							
1128							
1129	004372	012737	030000	177776	MOV	@#KM+PUM, @#PSW	; KERNEL MODE!!!, PREV USER MODE!!
1130	004400	012716	177777		MOV	@-1, (KSP)	; PUT @-1 ON KERNEL STACK
1131	004404	012702	000002		MOV	@2, R2	; LOAD INDEX REGISTER
1132	004410	012737	120000	001010	MOV	@VIRT, @#TEMP+4	; LOAD ADDRESS
1133	004416	005037	017200		CLR	@#PHYS	; PRESET DATA
1134	004422	005237	177572		INC	@#SRO	; ENABLE MEMORY MANAG.
1135							
1136	004426	006672	001006		KU7: MTP	@TEMP+2(R2)	; VIRT+(KSP)+
1137	004432	005037	177572		CLR	@#SRO	; DISABLE MEMORY MANAG.
1138	004436	005237	017200		INC	@#PHYS	; CHECK RESULT
1139	004442	001401			BEQ	.+4	
1140	004444	000000			HLT		; ERROR! INCORRECT RESULT
1141	004446	104000			SCOPE		



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1142
1143
1144      ;TEST THAT MTP1 CAN LOAD USER
1145      ;DM=0,PC
1145      004450 012737 030000 177776      MOV      #KM+PUM, @#PSW      ;KERNEL MODE!!!, PREV USER MODE!!
1146      004456 012716 004472              MOV      #KU10A, (KSP)      ;PUT NEW PC ON STACK AS DATA
1147      004462 005237 177572              INC      @#SRO              ;ENABLE MEMORY MANAG.
1148
1149      004466 006607              KU10:   MTP1      PC      ;PC+(KSP)+
1150      004470 000000              HLT
1151      004472 005037 177572      KU10A:  CLR      @#SRO      ;ERROR! MTP1 DID NOT LOAD NEW PC
1152      004476 104000              SCOPE      ;DISABLE MEMORY MANAG.
1153
1154      ;DM=2,PC
1155      004500 012737 030000 177776      MOV      #KM+PUM, @#PSW      ;KERNEL MODE!!!, PREV USER MODE!!
1156      004506 012716 177777              MOV      #-1, (KSP)         ;PUT #-1 ON KERNEL STACK
1157      004512 012767 004532 173530      MOV      #KU11A, MMVEC      ;LOAD SEG ERR VECTOR
1158      004520 005237 177572              INC      @#SRO              ;ENABLE MEMORY MANAG.
1159
1160      004524 006627              KU11:   MTP1      (PC)+    ;(PC)++(KSP)+, SHOULD ABORT
1161      004526 000000              HLT
1162
1163      004530 000000              KU11A:  HLT
1164      004532 005037 177572              CLR      @#SRO              ;ERROR! DID NOT ABORT AND PC DID NOT
1165      004536 022706 001056              CMP      #KPTR-2, KSP      ;AUTO-INCREMENT
1166      004542 001401              BEQ      .+4                ;ERROR! DID NOT ABORT
1167      004544 000000              HLT
1168      004546 012767 000462 173474      MOV      #MMERR, MMVEC      ;DISABLE MEMORY MANAG.
1169      004554 104000              SCOPE      ;CHECK THAT STACK PTR WAS PUSHED TWICE
1170
1171      ;DM=3,PC
1172      004556 012737 030000 177776      MOV      #PUM, @#PSW        ;KERNEL MODE!!!, PREV USER MODE!!
1173      004564 012716 177777              MOV      #-1, (KSP)         ;PUT #-1 ON KERNEL STACK
1174      004570 005037 017200              CLR      @#PHYS
1175      004574 005237 177572              INC      @#SRO              ;ENABLE MEMORY MANAG.
1176
1177      004600 006637 120000              KU12:   MTP1      @#VIRT    ;VIRT+(KSP)+
1178      004604 016700 173166              MOV      PSW, RO           ;SAVE STATUS RESULT
1179      004610 005037 177572              CLR      @#SRO           ;DISABLE MEMORY MANAG.
1180      004614 122700 000010              CMPB    #N, RO           ;CHECK STATUS RESULT
1181      004620 001401              BEQ      .+4
1182      004622 000000              HLT
1183      004624 005267 012350              INC      PHYS              ;ERROR! INCORRECT STATUS RESULT
1184      004630 001401              BEQ      .+4                ;CHECK RESULT
1185      004632 000000              HLT
1186      004634 005067 173136              CLR      PSW              ;ERROR! INCORRECT RESULT
1187      004640 104000              SCOPE
1188
1189      ;DM=4,PC
1190      004642 012737 030000 177776      MOV      #KM+PUM, @#PSW      ;KERNEL MODE!!!, PREV USER MODE!!
1191      004650 005016              CLR      (KSP)             ;PUT 0 ON KERNEL STACK
1192      004652 016702 000012              MOV      KU13, R2          ;SAVE MTP1 INSTRUCTION
1193      004656 012767 004674 173364      MOV      #KU13A, MMVEC      ;LOAD SEG ERR VECTOR
1194      004664 005237 177572              INC      @#SRO              ;ENABLE MEMORY MANAG.
1195
1196      004670 006647              KU13:   MTP1      -(PC)    ;-(PC)+(KSP)+
1197      004672 000000              HLT
1198

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1198 004674 005037 177572          KU13A: CLR      @#SRO          ;DISABLE MEMORY MANAG.
1199 004700 010267 177764          MOV      R2,KU13 ;RESTORE INSTRUCTION
1200 004704 012767 000462 173336  MOV      @#MERR,@#MVEC
1201 004712 104000          SCOPE
1202
1203          ;DM=6,PC
1204 004714 012737 030340 177776  MOV      @PUM+PRTY7,@#PSW          ;KERNEL MODE!!!,PREV USER MODE!!
1205 004722 005016          CLR      (KSP)          ;PUT 0 ON KERNEL STACK
1206 004724 012767 177777 012252  MOV      @-1,@#PHYS+4
1207 004732 005237 177572          INC      @#SRO          ;ENABLE MEMORY MANAG.
1208
1209 004736 000277          SCC
1210 004740 006667 113040          KU14: MTPI      VIRT+4          ;VIRT+4+(KSP)+
1211 004744 016703 173026          MOV      PSW,R3          ;SAVE STATUS RESULT
1212 004750 005037 177572          CLR      @#SRO          ;DISABLE MEMORY MANAG.
1213 004754 022706 001062          CMP      @#KPTR+2,KSP    ;CHECK THAT STACK PTR POPPED
1214 004760 001401          BEQ      .+4
1215 004762 000000          HLT
1216 004764 122703 000345          CMPB    @#PRTY7+Z+C,R3  ;ERROR! INCORRECT STACK PTR
1217 004770 001401          BEQ      .+4          ;CHECK STATUS RESULT
1218 004772 000000          HLT
1219 004774 005737 017204          TST     @#PHYS+4          ;ERROR! INCORRECT STATUS RESULT
1220 005000 001401          BEQ      .+4          ;CHECK RESULT
1221 005002 000000          HLT
1222 005004 104000          SCOPE          ;ERROR! INCORRECT RESULT
1223
1224          ;DM=7,PC
1225
1226 005006 012737 030000 177776  MOV      @#KM+PUM,@#PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1227 005014 012716 177777          MOV      @-1,(KSP)      ;PUT @-1 ON KERNEL STACK
1228 005020 012737 120004 001004  MOV      @#VIRT+4,@#TEMP ;LOAD ADDRESS
1229 005026 005037 017204          CLR      @#PHYS+4          ;PRESET DATA
1230 005032 005237 177572          INC      @#SRO          ;ENABLE MEMORY MANAG.
1231
1232 005036 006677 173742          KU15: MTPI      @#TEMP          ;VIRT+4+(KSP)+
1233 005042 005037 177572          CLR      @#SRO          ;DISABLE MEMORY MANAG.
1234 005046 005237 017204          INC      @#PHYS+4          ;CHECK RESULT
1235 005052 001401          BEQ      .+4
1236 005054 000000          HLT
1237 005056 104000          SCOPE          ;ERROR INCORRECT RESULT
1238
1239
1240          ;CHECK THAT MTPI CAN SET USER STACK PTR & PUSH DATA ONTO USER STACK
1241 005060 012737 030000 177776  MOV      @#PUM,@#PSW          ;KERNEL MODE!!!,PREV USER MODE!!
1242 005066 012746 120000          MOV      @#VIRT,-(KSP)
1243 005072 005046          CLR      -(KSP)          ;PUT DATA ON THE STACK
1244 005074 012746 120000          MOV      @#VIRT,-(KSP)
1245 005100 012737 177777 017200  MOV      @-1,@#PHYS          ;PRESET STACK DATA
1246 005106 005237 177572          INC      @#SRO          ;ENABLE MEMORY MANAG.
1247
1248 005112 006606          KU16: MTPI      USP          ;USP+(KSP)+
1249 005114 006636          MTPI      @#(KSP)+        ;VIRT+(KSP)+
1250 005116 005037 177572          CLR      @#SRO          ;DISABLE MEMORY MANAG.
1251 005122 106506          MFPD     USP          ;GET USER STACK PTR
1252 005124 022716 120000          CMP      @#VIRT,(KSP)    ;CHECK THAT MTPI USP SET USER STACK PTR
1253 005130 001401          BEQ      .+4

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1310	005364	005037	017200		CLR	2#PHYS	:PRESET PHYSICAL ADDRESS
1311	005370	005237	177572		INC	2#SR0	:ENABLE MEMORY MANAGEMENT
1312	005374	006522		KUF2:	MFPI	(R2)+	:(KSP)+VIRT
1313	005376	005037	177572		CLR	2#SR0	:DISABLE MEMORY MANAGEMENT
1314	005402	005716			TST	(KSP)	:CHECK RESULT
1315	005404	001401			BEQ	.+4	
1316	005406	000000			HLT		:ERROR! INCORRECT RESULT ON STACK
1317	005410	022702	120002		CMP	#VIRT+2,R2	:CHECK AUTO INCREMENT
1318	005414	001401			BEQ	.+4	
1319	005416	000000			HLT		:ERROR! AUTO INCREMENT FAILED
1320	005420	005067	172352		CLR	PSW	
1321	005424	104000			SCOPE		
1322							
1323							
1324	005426	012767	030000	172342	MOV	#KH+PUM,PSW	:KERNEL MODE!!!,PREV USER MODE!!
1325	005434	005066	177776		CLR	-2(KSP)	
1326	005440	012702	001004		MOV	#TEMP,R2	:LOAD INDIRECT ADDRESS
1327	005444	012737	120002	001004	MOV	#VIRT+2,2#TEMP	:LOAD ADDRESS
1328	005452	012737	177777	017202	MOV	#-1,2#PHYS+2	:PRESET DATA
1329	005460	005237	177572		INC	2#SR0	:ENABLE MEMORY MANAGEMENT
1330	005464	006532		KUF3:	MFPI	2(R2)+	:(KSP)+VIRT+2
1331	005466	005037	177572		CLR	2#SR0	:DISABLE MEMORY MANAGEMENT
1332	005472	005216			INC	(KSP)	:CHECK RESULT
1333	005474	001401			BEQ	.+4	
1334	005476	000000			HLT		:ERROR! INCORRECT RESULT
1335	005500	104000			SCOPE		
1336							
1337							
1338	005502	012767	030000	172266	MOV	#KH+PUM,PSW	:KERNEL MODE!!!,PREV USER MODE!!
1339	005510	012766	177777	177776	MOV	#-1,-2(KSP)	
1340	005516	012704	120002		MOV	#VIRT+2,R4	:R4=VIRTUAL ADDRESS+2
1341	005522	005037	017200		CLR	2#PHYS	:PRESET PHYSICAL ADDRESS DATA
1342	005526	005237	177572		INC	2#SR0	:ENABLE MEMORY MANAGEMENT
1343	005532	006544		KUF4:	MFPI	-(R4)	:(KSP)+VIRT
1344	005534	005037	177572		CLR	2#SR0	:DISABLE MEMORY MANAGEMENT
1345	005540	022704	120000		CMP	#VIRT,R4	:CHECK AUTO-DECREMENT
1346	005544	001401			BEQ	.+4	
1347	005546	000000			HLT		:ERROR! AUTO-DECREMENT FAILED
1348	005550	005716			TST	(KSP)	:CHECK RESULT
1349	005552	001401			BEQ	.+4	
1350	005554	000000			HLT		:ERROR! INCORRECT RESULT
1351	005556	104000			SCOPE		
1352							
1353							
1354	005560	012767	030000	172210	MOV	#PUM,PSW	:KERNEL MODE!!!,PREV USER MODE!!
1355	005566	005066	177776		CLR	-2(KSP)	
1356	005572	012701	001006		MOV	#TEMP+2,R1	:R1=INDIRECT ADDRESS
1357	005576	012737	120004	001004	MOV	#VIRT+4,2#TEMP	:LOAD ADDRESS
1358	005604	012737	177777	017204	MOV	#-1,2#PHYS+4	:PRESET PHYSICAL ADDRESS DATA
1359	005612	005237	177572		INC	2#SR0	:ENABLE MEMORY MANAGEMENT
1360	005616	006551		KUF5:	MFPI	2-(R1)	:(KSP)+VIRT+4
1361	005620	005037	177572		CLR	2#SR0	:DISABLE MEMORY MANAGEMENT
1362	005624	005216			INC	(KSP)	:CHECK RESULT
1363	005626	001401			BEQ	.+4	
1364	005630	000000			HLT		
1365	005632	005067	172140		CLR	PSW	

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1366 005636 104000          SCOPE
1367
1368
1369 005640 012767 030000 172130 ;DM=6  MOV    @PUM,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1370 005646 012766 177777 177776  MOV    @-1,-2(KSP)
1371 005654 012702 000002          MOV    @2,R2        ;LOAD INDEX REGISTER
1372 005660 005037 017202          CLR    @@PHYS+2     ;PRESET PHYSICAL ADDRESS DATA
1373 005664 005237 177572          INC    @@SRO        ;ENABLE MEMORY MANAGEMENT
1374 005670 005562 120000          KUF6: MFPI  VIRT(R2)   ;-(KSP)+VIRT-2
1375 005674 005037 177572          CLR    @@SRO        ;DISABLE MEMORY MANAGEMENT
1376 005700 022706 001056          CMP    @KPTR-2,KSP ;CHECK STACK PTR
1377 005704 001401          BEQ    .+4
1378 005706 000000          HLT
1379 005710 005716          TST   (KSP)        ;ERROR! INCORRECT STACK PTR
1380 005712 001401          BEQ    .+4        ;CHECK RESULT
1381 005714 000000          HLT
1382 005716 005067 172054          CLR    PSW        ;ERROR! INCORRECT RESULT
1383 005722 104000          SCOPE
1384
1385
1386 005724 012767 030000 172044 ;DM=7  MOV    @KM+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1387 005732 005066 177776          CLR    -2(KSP)
1388 005736 012702 177774          MOV    @-4,R2      ;LOAD INDEX REGISTER
1389 005742 012737 120000 001004  MOV    @VIRT,@TEMP  ;LOAD ADDRESS
1390 005750 012737 177777 017200  MOV    @-1,@PHYS   ;CLEAR PHYSICAL ADDRESS DATA
1391 005756 005237 177572          INC    @@SRO        ;ENABLE MEMORY MANAGEMENT
1392 005762 006572 001010          KUF7: MFPI  @TEMP+4(R2) ;-(KSP)+VIRT
1393 005766 005037 177572          CLR    @@SRO        ;DISABLE MEMORY MANAGEMENT
1394 005772 005216          INC    (KSP)       ;CHECK RESULT
1395 005774 001401          BEQ    .+4
1396 005776 000000          HLT
1397 006000 104000          SCOPE
1398
1399          ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
1400          ;DM=0,PC
1401 006002 012767 030000 171766  MOV    @KM+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1402 006010 005066 177776          CLR    -2(KSP)
1403 006014 005237 177572          INC    @@SRO        ;ENABLE MEMORY MANAGEMENT
1404 006020 000277          SCC
1405 006022 006507          KUF10: MFPI  PC      ;-(KSP)+PC
1406 006024 016702 171746          MOV    PSW,R2      ;SAVE CC'S
1407 006030 005037 177572          CLR    @@SRO        ;DISABLE MEMORY MANAGEMENT
1408 006034 122702 000001          CMPB  @C,R2        ;CHECK CC'S
1409 006040 001401          BEQ    .+4
1410 006042 000000          HLT
1411 006044 022706 001056          CMP    @KPTR-2,KSP ;CHECK STACK PTR
1412 006050 001401          BEQ    .+4
1413 006052 000000          HLT
1414 006054 022716 006024          CMP    @KUF10+2,(KSP) ;ERROR! STACK NOT PUSHED
1415 006060 001401          BEQ    .+4        ;CHECK THAT PC WAS PUSHED ON THE STACK
1416 006062 000000          HLT
1417 006064 104000          SCOPE
1418
1419
1420
1421          ;DM=3,PC

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1422 006066 012767 030000 171702      MOV      @PUM,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1423 006074 005066 177776      CLR      -2(KSP)
1424 006100 012737 177777 017200      MOV      @-1,@PHYS
1425 006106 005237 177572      INC      @SR0          ;ENABLE MEMORY MANAGEMENT
1426 006112 005537 120000      MFPI    @VIRT         ;-(KSP)+VIRT
1427 006116 005037 177572      CLR      @SR0          ;DISABLE MEMORY MANAGEMENT
1428 006122 005216      INC      (KSP)         ;CHECK RESULT
1429 006124 001401      BEQ     .+4
1430 006126 000000      HLT
1431 006130 104000      SCOPE
1432
1433      ;DM=6,PC
1434 006132 012767 030340 171636      MOV      @PUM+PTY7,PSW ;KERNEL MODE!!!,PREV USER MODE!!
1435 006140 012766 177777 177776      MOV      @-1,-2(KSP)
1436 006146 005037 017200      CLR      @PHYS        ;PRESET PHYSICAL ADDRESS DATA
1437 006152 005237 177572      INC      @SR0          ;ENABLE MEMORY MANAGEMENT
1438 006156 006567 111616      MFPI    VIRT          ;-(KSP)+VIRT
1439 006162 005037 177572      CLR      @SR0          ;DISABLE MEMORY MANAGEMENT
1440 006166 005716      TST     (KSP)         ;CHECK RESULT
1441 006170 001401      BEQ     .+4
1442 006172 000000      HLT
1443 006174 104000      SCOPE
1444
1445      ;DM=7,PC
1446 006176 012767 030000 171572      MOV      @KH+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1447 006204 005066 177776      CLR      -2(KSP)
1448 006210 012737 120004 001004      MOV      @VIRT+4,@TEMP ;LOAD ADDRESS
1449 006216 012737 177777 017204      MOV      @-1,@PHYS+4 ;PRESET DATA
1450 006224 005237 177572      INC      @SR0          ;ENABLE MEMORY MANAGEMENT
1451 006230 000277      SCC
1452 006232 006577 172546      MFPI    @TEMP         ;-(KSP)+VIRT+4
1453 006236 016702 171534      MOV      PSW,R2       ;SAVE CC'S
1454 006242 005037 177572      CLR      @SR0          ;DISABLE MEMORY MANAGEMENT
1455 006246 122702 000011      CNPB   @N+C,R2       ;CHECK CC'S
1456 006250 001401      BEQ     .+4
1457 006254 000000      HLT
1458 006256 005216      INC      (KSP)         ;ERROR! INCORRECT CC'S
1459 006260 001401      BEQ     .+4           ;CHECK RESULT
1460 006262 000000      HLT
1461 006264 104000      SCOPE
1462
1463 006266 012767 030000 171502      MOV      @KH+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1464 006274 012716 120000      MOV      @VIRT,(KSP)
1465 006300 005037 017200      CLR      @PHYS
1466 006304 005237 177572      INC      @SR0          ;ENABLE MEMORY MANAGEMENT
1467 006310 006576 000000      MFPI    @KSP         ;-(KSP)+VIRT
1468 006314 005037 177572      CLR      @SR0          ;DISABLE MEMORY MANAGEMENT
1469 006320 005737 001056      TST     @KPTR-2      ;CHECK DATA ON THE STACK
1470 006324 001401      BEQ     .+4
1471 006326 000000      HLT
1472 006330 104000      SCOPE
1473
1474      ;BEGIN TESTING IN USER MODE
1475      ;NOTE: ALL HLT (HALT) INSTRUCTIONS WILL TRAP TO LOC 10. THE PROGRAM WILL
1476      ;ALLOW THE TRAP,ADJUST THE PC AND RETURN TO THE HLT IN KERNEL MODE. THE
1477      ;USER STACK POINTER IS NOT AFFECTED BY THIS TRAP. THE USER STACK POINTER

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1478                                     ; IS AT PHYSICAL 0600.
1479
1480 006332 012706 000600                USRTST: MOV      #UPTR,USP      ;SET USER STACK PTR
1481 006336 000240                        NOP                          ;BEGIN TESTS IN USER MODE
1482 006340 012767 077406 171232        MOV      #77406,UPDR0      ;RN, UP 200 BLOCKS
1483 006346 012767 077406 171242        MOV      #77406,UPDR7      ;RN, UP 200 BLOCKS
1484 006354 012767 007600 171274        MOV      #7600,UPAR7
1485
1486                                     ; TESTS UU0-UU6 TEST THE MTP1 INSTRUCTION IN USER MODE, PREV USER MODE.
1487                                     ; TEST THAT MTP1 CAN LOAD A GENERAL REGISTER (R2)
1488 006362 012737 170340 177776        MOV      #UH+PUM+PRTY7, @#PSW ;USER MODE!!!,PREV USER MODE!!
1489 006370 005016                        CLR      (USP)
1490 006372 012702 177777                MOV      @-1,R2            ;PRESET REGISTER
1491 006376 005237 177572                INC      @#SRO             ;ENABLE MEMORY MANAG.
1492
1493                                     UU0:
1494 006402 006602                        MTP1     R2                ;R2+(USP)+
1495 006404 016703 171366                MOV      PSM,R3           ;SAVE STATUS RESULT
1496 006410 005037 177572                CLR      @#SRO            ;DISABLE MEMORY MANAG.
1497 006414 022706 000602                CMP      #UPTR+2,USP      ;CHECK THAT STACK POPPED
1498 006422 000000                        BEQ      .+4
1499 006424 122703 000344                HLT
1500 006430 001471                        CMPB    #PRTY7+Z,R3       ;ERROR! INCORRECT STACK PTR
1501 006432 000000                        BEQ      .+4              ;CHECK STATUS RESULT
1502 006434 005702                        HLT
1503 006436 001401                        TST     R2                ;ERROR! INCORRECT STATUS RESULT
1504 006440 000000                        BEQ      .+4              ;CHECK RESULT
1505 006442 104000                        HLT
1506                                     SCOPE
1507
1508                                     ;TEST THAT USER CAN LOAD USER ADDRESS (VIRT)
1509
1510                                     ;*****
1511                                     VIRT=12000 ;USER VIRTUAL ADDRESS FOR THESE TESTS
1512                                     PHYS=17200 ;CORRESPONDING PHYSICAL ADDRESS
1513                                     ;*****
1514
1515                                     ;DM=2
1516 006444 012737 170000 177776        MOV      #UH+PUM, @#PSW   ;USER MODE!!!,PREV USER MODE!!
1517 006452 012716 177777                MOV      @-1,(USP)
1518 006456 012702 120000                MOV      #VIRT,R2        ;R2=VIRT ADDRESS
1519 006462 005037 017200                CLR      @#PHYS          ;PRESET DATA
1520 006466 005237 177572                INC      @#SRO            ;ENABLE MEMORY MANAG.
1521
1522                                     UU1:
1523 006472 006622                        MTP1     (R2)+            ;VIRT+(USP)+
1524 006474 005037 177572                CLR      @#SRO            ;DISABLE MEMORY MANAG.
1524 006500 005237 017200                INC      @#PHYS          ;CHECK RESULT

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1532	006504	001401			BEQ	.+4		
1533	006506	000000			HLT			;ERROR! INCORRECT RESULT
1534	006510	022702	120002		CMP	@VIRT+2,R2		;CHECK AUTO-INCREMENT
1535	006514	001401			BEQ	.+4		
1536	006516	000000			HLT			;ERROR! AUTO-INCREMENT FAILED
1537	006520	005067	171252		CLR	PSW		
1538	006524	104000			SCOPE			
1539								;DM=4
1540	006526	012737	170000	177776	MOV	@UM+PUM,@PSW		;USER MODE!!!,PREV USER MODE!!
1541	006534	005016			CLR	(USP)		
1542	006536	012704	120002		MOV	@VIRT+2,R4		;LOAD ADDRESS
1543	006542	012737	177777	017200	MOV	@-1,@PHYS		;PRESET DATA
1544	006550	005237	177572		INC	@SRO		;ENABLE MEMORY MANAG.
1545								UU2:
1546	006554	006644			MTPI	-(R4)		;VIRT+(USP)+
1547	006556	005037	177572		CLR	@SRO		;DISABLE MEMORY MANAG.
1548	006562	022704	120000		CMP	@VIRT,R4		;CHECK AUTO-DECREMENT
1549	006566	001401			BEQ	.+4		
1550	006570	000000			HLT			;ERROR! AUTO-DECREMENT FAILED
1551	006572	005737	017200		TST	@PHYS		;CHECK RESULT
1552	006576	001401			BEQ	.+4		
1553	006600	000000			HLT			;ERROR! INCORRECT RESULT
1554	006602	104000			SCOPE			
1555								;DM=6
1556	006604	012737	170000	177776	MOV	@UM+PUM,@PSW		;USER MODE!!!,PREV USER MODE!!
1557	006612	005016			CLR	(USP)		
1558	006614	012702	000002		MOV	@2,R2		;LOAD INDEX REGISTER
1559	006620	012767	177777	010354	MOV	@-1,@PHYS+2		;PRESET DATA
1560	006626	005237	177572		INC	@SRO		;ENABLE MEMORY MANAG.
1561								UU3:
1562	006632	006662	120000		MTPI	VIRT(R2)		;VIRT+2+(USP)+
1563	006636	016700	171134		MOV	PSW,R0		;SAVE STATUS RESULT
1564	006642	005037	177572		CLR	@SRO		;DISABLE MEMORY MANAG.
1565	006646	022706	000602		CMP	@UPTR+2,USP		;CHECK THAT STACK POINTER POPPED
1566	006652	001401			BEQ	.+4		
1567	006654	000000			HLT			;ERROR! INCORRECT STACK PTR
1568	006656	122700	000004		CMPB	@Z,R0		;CHECK STATUS RESULT
1569	006662	001401			BEQ	.+4		
1570	006664	000000			HLT			;ERROR! INCORRECT STATUS RESULT
1571	006666	005737	017202		TST	@PHYS+2		;CHECK RESULT
1572	006672	001401			BEQ	.+4		
1573	006674	000000			HLT			;ERROR! INCORRECT RESULT
1574	006676	104000			SCOPE			
1575								;TEST THAT MTPI CAN LOAD PC
1576								;DM=0,PC
1577	006700	012737	170000	177776	MOV	@UM+PUM,@PSW		;USER MODE!!!,PREV USER MODE!!
1578	006706	012716	006722		MOV	@U4A,(USP)		;PUT NEW PC ON STACK AS DATA
1579	006712	005237	177572		INC	@SRO		;ENABLE MEMORY MANAG.
1580								UU4:
1581	006716	006607			MTPI	PC		;PC+(USP)+
1582	006720	000000			HLT			;ERROR! MTPI DID NOT LOAD PC
1583	006722	005037	177572		CLR	@SRO		;DISABLE MEMORY MANAG.
1584	006726	104000			SCOPE			



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1581                                     ;DM=3,PC
1582 006730 012737 170000 177776      MOV      @UM+PUM,@PSW      ;USER MODE!!!,PREV USER MODE!!
1583 006736 012716 177777              MOV      @-1,(USP)
1584 006742 005037 017200              CLR      @PHYS
1585 006746 005237 177572              INC      @SRO              ;ENABLE MEMORY MANAG.
1586
1587 006752 006637 120000              UUS:    MTPPI           @VIRT           ;VIRT+(USP)+
1588 006756 016700 171014              MOV      PSW,R0           ;SAVE STATUS RESULT
1589 006762 005037 177572              CLR      @SRO           ;DISABLE MEMORY MANAG.
1590 006766 122700 000010              CMPB    @N,R0           ;CHECK STATUS RESULT
1591 006772 001401                      BEQ      .+4
1592 006774 000000                      HLT
1593 006776 005267 010176              INC      PHYS            ;ERROR! INCORRECT STATUS RESULT
1594 007002 001401                      BEQ      .+4            ;CHECK RESULT
1595 007004 000000                      HLT
1596 007006 005067 170764              CLR      PSW            ;ERROR! INCORRECT RESULT
1597 007012 104000                      SCOPE
1598
1599                                     ;DM=7,PC
1600 007014 012737 170000 177776      MOV      @UM+PUM,@PSW      ;USER MODE!!!,PREV USER MODE!!
1601 007022 012716 177777              MOV      @-1,(USP)
1602 007026 012737 120004 001004      MOV      @VIRT+4,@TEMP    ;LOAD ADDRESS
1603 007034 005037 017204              CLR      @PHYS+4         ;PRESET DATA
1604 007040 005237 177572              INC      @SRO            ;ENABLE MEMORY MANAG.
1605
1606 007044 006677 171734              UUS:    MTPPI           @TEMP           ;VIRT+4+(USP)+
1607 007050 005037 177572              CLR      @SRO           ;DISABLE MEMORY MANAG.
1608 007054 005237 017204              INC      @PHYS+4         ;CHECK RESULT
1609 007060 001401                      BEQ      .+4
1610 007062 000000                      HLT
1611 007064 104000                      SCOPE
1612                                     ;TEST MFPI INSTRUCTION USER MODE PREVIOUS USER MODE
1613 007066 012767 170000 170702      MOV      @UM+PUM,PSW      ;USER MODE!!!,PREV USER MODE!!
1614 007074 012703 177777              MOV      @-1,R3          ;PRESET GENERAL REGISTER
1615 007100 005237 177572              INC      @SRO            ;ENABLE MEMORY MANAGEMENT
1616 007104 006503                      MFPI    R3              ;-(USP)+R3
1617 007106 016702 170664              MOV      PSW,R2          ;SAVE STATUS AFTER MFPI
1618 007112 005037 177572              CLR      @SRO           ;DISABLE MEMORY MANAGEMENT
1619 007116 022702 170010              CMP      @UM+PUM+N,R2    ;CHECK STATUS AFTER MFPI
1620 007122 001401                      BEQ      .+4
1621 007124 000000                      HLT
1622 007126 022706 000576              CMP      @UPTR-2,USP     ;ERROR! INCORRECT STATUS AFTER MFPI
1623 007132 001401                      BEQ      .+4            ;CHECK THAT STACK WAS PUSHED
1624 007134 000000                      HLT
1625 007136 005216                      INC      (USP)           ;ERROR! INCORRECT STACK PTR
1626 007140 001401                      BEQ      .+4            ;CHECK RESULT
1627 007142 000000                      HLT
1628 007144 104000                      SCOPE
1629
1630                                     ;TEST THAT MFPI CAN GET DATA FROM A USER VIRTUAL ADDRESS
1631                                     ;DM=2
1632 007146 012767 170000 170622      MOV      @UM+PUM,PSW      ;USER MODE!!!,PREV USER MODE!!
1633 007154 012766 177777 177776      MOV      @-1,-2(USP)
1634 007162 012702 120000              MOV      @VIRT,R2        ;R2=VIRTUAL ADDRESS
1635 007166 005037 017200              CLR      @PHYS          ;PRESET PHYSICAL ADDRESS
1636 007172 005237 177572              INC      @SRO            ;ENABLE MEMORY MANAGEMENT

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1637	007176	006522			UUF2:	MFPI	(R2)+	;(USP)+VIRT
1638	007200	005037	177572			CLR	@#SRO	;DISABLE MEMORY MANAGEMENT
1639	007204	005716				TST	(USP)	;CHECK RESULT
1640	007206	001401				BEQ	.+4	
1641	007210	000000				HLT		;ERROR! INCORRECT RESULT ON STACK
1642	007212	022702	120002			CMP	@VIRT+2,R2	;CHECK AUTO INCREMENT
1643	007216	001401				BEQ	.+4	
1644	007220	000000				HLT		;ERROR! AUTO INCREMENT FAILED
1645	007222	005067	170550			CLR	PSW	
1646	007226	104000				SCOPE		
1647								
1648								
1649	007230	012767	170000	170540	;DM=4	MOV	@UM+PUM,PSW	;USER MODE!!!,PREV USER MODE!!
1650	007236	012766	177777	177776		MOV	@-1,-2(USP)	
1651	007244	012704	120002			MOV	@VIRT+2,R4	;R4=VIRTUAL ADDRESS+2
1652	007250	005037	017200			CLR	@#PHYS	;PRESET PHYSICAL ADDRESS DATA
1653	007254	005237	177572			INC	@#SRO	;ENABLE MEMORY MANAGEMENT
1654	007260	006544			UUF4:	MFPI	-(R4)	;(USP)+VIRT
1655	007262	005037	177572			CLR	@#SRO	;DISABLE MEMORY MANAGEMENT
1656	007266	022704	120000			CMP	@VIRT,R4	;CHECK AUTO-DECREMENT
1657	007272	001401				BEQ	.+4	
1658	007274	000000				HLT		;ERROR! AUTO-DECREMENT FAILED
1659	007276	005716				TST	(USP)	;CHECK RESULT
1660	007300	001401				BEQ	.+4	
1661	007302	000000				HLT		;ERROR! INCORRECT RESULT
1662	007304	104000				SCOPE		
1663								
1664								
1665	007306	012767	170000	170462	;DM=6	MOV	@UM+PUM,PSW	;USER MODE!!!,PREV USER MODE!!
1666	007314	012766	177777	177776		MOV	@-1,-2(USP)	
1667	007322	012702	000002			MOV	@2,R2	;LOAD INDEX REGISTER
1668	007326	005037	017202			CLR	@#PHYS+2	;PRESET PHYSICAL ADDRESS DATA
1669	007332	005237	177572			INC	@#SRO	;ENABLE MEMORY MANAGEMENT
1670	007336	006562	120000		UUF6:	MFPI	VIRT(R2)	;(USP)+VIRT-2
1671	007342	005037	177572			CLR	@#SRO	;DISABLE MEMORY MANAGEMENT
1672	007346	022706	000576			CMP	@UPTR-2,USP	;CHECK STACK PTR
1673	007352	001401				BEQ	.+4	
1674	007354	000000				HLT		;ERROR! INCORRECT STACK PTR
1675	007356	005716				TST	(USP)	;CHECK RESULT
1676	007360	001401				BEQ	.+4	
1677	007362	000000				HLT		;ERROR! INCORRECT RESULT
1678	007364	005067	170406			CLR	PSW	
1679	007370	104000				SCOPE		
1680								
1681								
1682								
1683	007372	012767	170000	170376	;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION ;DM=3,PC	MOV	@UM+PUM,PSW	;USER MODE!!!,PREV USER MODE!!
1684	007400	005066	177776			CLR	-2(USP)	
1685	007404	012737	177777	017200		MOV	@-1,@#PHYS	
1686	007412	005237	177572			INC	@#SRO	;ENABLE MEMORY MANAGEMENT
1687	007416	006537	120000		UUF11:	MFPI	@#VIRT	;(USP)+VIRT
1688	007422	005037	177572			CLR	@#SRO	;DISABLE MEMORY MANAGEMENT
1689	007426	005216				INC	(USP)	;CHECK RESULT
1690	007430	001401				BEQ	.+4	
1691	007432	000000				HLT		;ERROR! INCORRECT RESULT
1692	007434	104000				SCOPE		

```

1693
1694
1695 007436 012767 170340 170332 ;DM=6,PC      MOV      #UM+PUM+PTY7,PSW      ;USER MODE!!! PREV USER MODE!!
1696 007444 012766 177777 177776      MOV      #-1,-2(USP)
1697 007452 005037 017200      CLR      @#PHYS                ;PRESET PHYSICAL ADDRESS DATA
1698 007456 005237 177572      INC      @#SR0                ;ENABLE MEMORY MANAGEMENT
1699 007462 006567 110312      UUF12: MFPI VIRT              ;-(USP)+VIRT
1700 007466 005037 177572      CLR      @#SR0                ;DISABLE MEMORY MANAGEMENT
1701 007472 005716      TST      (USP)                ;CHECK RESULT
1702 007474 001401      BEQ      .+4
1703 007476 000000      HLT
1704 007500 104000      SCOPE                          ;ERROR! INCORRECT RESULT
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007502 005067 170270      END:   CLR      PSW
007506 005267 171266      INC      ICNT                  ;INCREMENT PASS COUNT
007512 026727 171262 001000      CMP      ICNT,#1000
007520 001402      BEQ      DONE
007522 000167 171350      JMP      BEGIN
007526 012767 000007 170032  DONE:  MOV      #7,TPB              ;RING BELL AFTER 1000
007534 105767 170024      TSTB    TPS                    ;PASSES
007540 100375      BPL     .-4
007542 013702 000042      MOV     @#42,R2                ;MONITOR LOAD?
007546 001405      BEQ     DONE1                  ;NO, CONTINUE
007550 000005      RESET
007552 004712      LOGIC: JSR     7,(2)            ;RETURN TO MONITOR
007554 000240      NOP
007556 000240      NOP
007560 000240      NOP
007562 000167 171302      DONE1: JMP     START                ;RESTART
000001      .END

```

\*\*\*\*\*IMPORTANT NOTE\*\*\*\*\*  
: NO CODE ALLOWED BETWEEN 16600-17776





LOGIC = 007552	445	1719*															
MNERR = 000462	442	476*	496	1168	1200												
MNVEC = 000250	239*	441	478	496*	497*	1157*	1168*	1193*	1200*								
N = 000010	228*	710	810	832	993	1180	1295	1455	1590	1619							
PC = %000007	220*	680*	693*	725*	943	1004	1149*	1160*	1196*	1405	1576*						
PFVEC = 000024	237*																
PHYS = 017200	530*	558*	571	580*	585*	597*	602*	610*	618	628*	633*	643*	655				
	664*	669*	704*	713*	733*	746	756*	762*	826*	847*	865*	878*	895*				
	909*	927*	962*	974*	987*	1018*	1024*	1037	1046*	1051*	1064*	1069*	1078*				
	1086	1096*	1101*	1111*	1123	1133*	1138*	1174*	1183*	1206*	1219	1229*	1234*				
	1245*	1255	1289*	1310*	1328*	1341*	1358*	1372*	1390*	1424*	1436*	1449*	1465*				
	1512*	1519*	1524*	1536*	1544	1553*	1565	1584*	1593*	1603*	1608*	1635*	1652*				
	1668*	1685*	1697*														
	230*																
PRTY4 = 000200	229*	783	794	803	810	972	1060	1204	1216	1434	1488	1499	1695				
PRTY7 = 000340	242*	471*	493*	539	563	577*	591*	624*	636*	640*	647	702*	708				
PSW = 177776	716*	720*	738	753*	769*	783*	789	803*	808	823*	830	844*	857*				
	861*	875*	891*	902*	906*	919*	923*	938*	944	960*	972*	984*	991				
	1021*	1029	1043*	1057*	1060*	1075*	1092*	1104*	1108*	1115	1129*	1145*	1155*				
	1172*	1178	1186*	1190*	1204*	1211	1226*	1241*	1264*	1270	1281*	1286*	1293				
	1307*	1320*	1324*	1338*	1354*	1365*	1369*	1382*	1386*	1401*	1406	1422*	1434*				
	1446*	1453	1463*	1488*	1494	1516*	1530*	1533*	1550*	1557	1572*	1582*	1588				
	1596*	1600*	1613*	1617	1632*	1645*	1649*	1665*	1678*	1683*	1695*	1708*					
PUM = 030000	233*	471	783	1021	1043	1060	1075	1092	1108	1129	1145	1155	1172				
	1190	1204	1226	1241	1264	1286	1307	1324	1338	1354	1369	1386	1401				
	1422	1434	1446	1463	1488	1516	1533	1550	1572	1582	1600	1613	1619				
	1632	1649	1665	1683	1695												
	300*																
RW = 000006	214*	647*	652	708*	710	893*	897	1115*	1120	1178*	1180	1266*	1269				
RO = %000000	1557*	1562	1588*	1590													
R1 = %000001	215*	466*	469	1356*	1361												
R2 = %000002	216*	500*	502*	504*	506*	508*	510*	512*	514*	535*	538*	547	557*				
	562*	579*	583*	588	595*	600*	626*	631*	642*	646*	662*	667*	722*				
	728	785*	788*	797	808*	810	825*	829	846*	849	854	863*	867				
	908*	911	925*	929	944*	946	991*	993	1023*	1028*	1045*	1049*	1054				
	1062*	1063*	1067*	1094*	1099*	1110*	1114*	1131*	1136*	1192*	1199	1288*	1292				
	1309*	1312	1317	1326*	1330	1371*	1374	1388*	1392	1406*	1408	1453*	1455				
	1490*	1493*	1502	1518*	1522*	1527	1552*	1556*	1617*	1619	1634*	1637	1642				
	1667*	1670	1716*														
R3 = %000003	217*	501*	503*	505*	507*	509*	511*	513*	515*	539*	544	563*	568				
	738*	743	789*	794	805*	807	830*	832	1029*	1034	1211*	1216	1293*				
	1295	1494*	1499	1614*	1616												
R4 = %000004	218*	609*	613*	615	877*	880	882	1077*	1081*	1083	1270*	1272	1340*				
	1343	1345	1535*	1539*	1541	1651*	1654	1656									
	219*																
R5 = %000005	304*	495	550	574	592	605	621	637	658	672	686	699	717				
SCOPE = 104000	729	750	765	779	800	819	841	858	872	888	903	920	934				
	955	969	981	999	1010	1040	1058	1072	1089	1105	1126	1141	1152				
	1169	1187	1201	1222	1237	1261	1282	1304	1321	1335	1351	1366	1383				
	1397	1417	1431	1443	1461	1472	1505	1531	1547	1568	1579	1597	1611				
	1628	1646	1662	1679	1692	1704											
	440	466*															
SCOPEA 000432	438	456*															
SHLT 000400	458	461*															
SHLTA 000422	243*																
SLR = 177774	258*																
SRO = 177572		476	477*	499*	536*	540*	559*	564*	581*	584*	598*	601*	611*				



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CROSS REFERENCE TABLE -- USER SYMBOLS

UUS 006752  
UU6 007044  
VIRT = 120000

1587#														
1606#														
529#	557	579	588	596	609	615	627	646*	663	707*	737*	755		
825	846	854	864	877	882	894	911	926	964	976	986	1017#		
1023	1045	1054	1063	1077	1083	1095	1114*	1132	1177*	1210*	1228	1242		
1244	1252	1288	1309	1317	1327	1340	1345	1357	1374	1389	1426	1438		
1448	1464	1511#	1518	1527	1535	1541	1556*	1587*	1602	1634	1642	1651		
1656	1670	1687	1699											
227#	544	568	652	743	794	1034	1120	1216	1272	1499	1562			
307#	308	310	312	314	316	318	320	322	324	326	328	330		
332	334	336	338	340	342	344	346	348	350	352	354	356		
358	360	362	364	366	368	370	372	374	376	378	380	382		
384	386	388	390	392	394	396	398	400	402	404	406	408		
410	412	414	416	418	420	422	424	426	428	430	432	434		
437#	439#	441#	444#	446#	450#	453#	480#	485#	489#	503	507	511		
515	542	545	548	566	569	572	586	589	603	616	619	634		
650	653	656	670	696*	697	711	714	741	744	747	763	776		
792	795	798	811	814	817	833	836	839	852	855	870	883		
886	900	914	917	932	947	950	953	967	979	994	997	1005		
1008	1032	1035	1038	1052	1055	1070	1084	1087	1102	1118	1121	1124		
1139	1166	1181	1184	1214	1217	1220	1235	1253	1256	1259	1273	1276		
1279	1296	1299	1302	1315	1318	1333	1346	1349	1363	1377	1380	1395		
1409	1412	1415	1429	1441	1456	1459	1470	1497	1500	1503	1525	1528		
1542	1545	1560	1563	1566	1591	1594	1609	1620	1623	1626	1640	1643		
1657	1660	1673	1676	1690	1702	1715								

Z = 000004  
. = 007566



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CROSS REFERENCE TABLE -- MACRO NAMES

CONVEN	10
ENDCOM	10
ESCAPE	10
GETPRI	10
GETSMR	10
MULT	10
NEWST	10
POP	10
PUSH	10
REPORT	10
SETPRI	10
SETUP	10
SKIP	10
SLASH	10
STARS	10
SMRSU	10
TYPBIN	10
TYPDEC	10
TYPNAM	10
TYPNUM	10
TYPPCS	10
TYPCT	10
TYPTXT	10
SSESCA	10
SSNEW	10
SSSKIP	10
.EQUAT	10
.HEADE	10
.KTI1	10
.SETUP	10
.SMR:	10
.SACT1	10
.SAPT8	10
.SAPTH	10
.SAPTY	10
.SASTA	10
.SCATC	10
.SCHTA	10
.SDB2D	10
.SDB20	10
.SDIV	10
.SEOP	10
.SERRO	10
.SERRT	10
.SMULT	10
.SPOWE	10
.SRAND	10
.SRODE	10
.SRODC	10
.SREAD	10
.SR2AZ	10
.SSAVE	10
.SSB2D	10
.SSB20	10
.SSCOP	10
.SSIZE	10

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CROSS REFERENCE TABLE -- MACRO NAMES

.SSUPR	18
.STRAP	18
.STYPB	18
.STYPD	18
.STYPE	18
.STYPO	18
.S4OCA	18
.1170	18

ADD BEQ	459 458 656 817 953 1118 1276 1412 1563 1702	542 670 833 967 1121 1279 1415 1566 1711	545 697 836 979 1124 1296 1429 1591 1717	548 711 839 994 1139 1299 1441 1594	566 714 852 997 1166 1302 1456 1609	569 741 855 1008 1181 1315 1459 1620	572 744 870 1032 1184 1318 1470 1623	586 747 883 1035 1214 1333 1497 1626	589 763 886 1038 1217 1346 1500 1640	603 776 900 1052 1220 1349 1503 1643	616 792 914 1055 1235 1363 1525 1657	619 795 917 1070 1253 1377 1528 1660	634 798 932 1084 1256 1380 1542 1673	650 811 947 1087 1259 1395 1545 1676	653 814 950 1102 1273 1409 1560 1690
BIC BPL BR CLR	461 1715 684 468 580 683 784 881 974 1096 1212 1341 1439 1584 1688	1005 477 584 685 790 892 977 1100 1229 1344 1447 1589 1697	492 591 690 804 898 984 1104 1233 1355 1454 1596 1700	493 597 695 809 902 985 1109 1243 1361 1465 1603 1708	497 601 704 823 909 992 1116 1250 1365 1468 1607	499 608 709 824 912 1006 1133 1266 1372 1489 1618	502 614 716 831 919 1022 1137 1271 1375 1495 1635	506 628 727 847 923 1030 1151 1281 1382 1519 1638	510 632 732 850 924 1046 1164 1287 1387 1523 1645	514 636 739 857 930 1050 1174 1294 1393 1530 1652	521 641 753 861 938 1057 1179 1310 1402 1534 1655	534 648 756 862 940 1064 1186 1313 1407 1540 1668	540 664 761 868 945 1068 1191 1320 1423 1551 1671	556 668 770 875 961 1076 1198 1325 1427 1558 1678	564 677 774 878 965 1082 1205 1331 1436 1578 1684
CMP	541 1031 1496	565 1054 1527	588 1083 1541	615 1117 1559	649 1165 1619	740 1213 1622	791 1252 1642	813 1258 1656	835 1275 1672	854 1298 1710	882 1317	913 1345	949 1376	952 1411	1007 1414
CMPB	544 1295	568 1408	652 1455	710 1499	743 1562	794 1590	810	832	946	993	1034	1120	1180	1216	1272
EHT HALT	304 303 337 367 397 427 536 705 879 1051 1230 1403 1604	309 339 369 399 429 559 713 896 1065 1234 1425 1608	311 341 371 401 431 581 723 899 1069 1246 1428 1615	313 343 373 403 433 585 734 910 1079 1267 1437 1625	315 345 375 405 435 598 757 928 1097 1290 1450 1636	317 347 377 407 437 602 762 931 1101 1301 1458 1653	319 349 379 409 439 611 771 941 1112 1311 1466 1669	321 351 381 411 629 786 963 1134 1329 1491 1686	323 353 383 413 633 806 966 1138 1332 1491 1689	325 355 385 415 644 816 975 1147 1342 1524 1698	327 357 387 417 665 827 988 1158 1359 1537 1709	329 359 389 419 669 838 996 1175 1362 1554	331 361 391 421 678 848 1003 1183 1373 1574	333 363 393 423 691 866 1025 1194 1391 1585	335 365 395 425 696 869 1047 1207 1394 1593
INC	451 1719 1251 807 1312 1687	460 829 1330 1699	478 849 1343	1712 867 1360	1723 880 1374	1653 897 1392	1669 911 1405	1686 929 1426	1689 943 1438	1698 964 1452	1709 976 1467	990 1616	1004 1637	1269 1654	1292 1670
JMP JSR MFPD MFPI	451 1719 1251 807 1312 1687	460 829 1330 1699	478 849 1343	1712 867 1360	1723 880 1374	1653 897 1392	1669 911 1405	1686 929 1426	1689 943 1438	1698 964 1452	1709 976 1467	990 1616	1004 1637	1269 1654	1292 1670
MOV	466 513 577 647 754 846 927	467 516 578 661 755 863 939	469 517 579 662 769 864 944	470 518 594 663 778 865 960	471 519 595 676 783 876 962	476 520 596 689 785 877 972	494 522 609 702 789 891 973	496 523 610 703 789 893 986	500 524 624 708 805 894 987	501 525 625 720 808 895 991	504 535 626 721 825 906 1002	505 539 627 722 826 907 1021	508 557 640 728 830 908 1023	509 558 642 733 844 925 1024	512 563 643 738 845 926 1029

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CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

	1043	1044	1045	1060	1061	1062	1063	1075	1077	1078	1092	1093	1094	1095	1108
	1110	1111	1115	1129	1130	1131	1132	1145	1146	1155	1156	1157	1168	1172	1173
	1178	1190	1192	1193	1199	1200	1204	1206	1211	1226	1227	1228	1241	1242	1244
	1245	1264	1265	1270	1286	1288	1289	1293	1307	1308	1309	1324	1326	1327	1328
	1338	1339	1340	1354	1355	1357	1358	1369	1370	1371	1386	1388	1389	1390	1401
	1406	1422	1424	1434	1435	1446	1448	1449	1453	1463	1464	1480	1482	1483	1484
	1488	1490	1494	1516	1517	1518	1533	1535	1536	1550	1552	1553	1557	1572	1573
	1582	1583	1588	1600	1601	1602	1613	1614	1617	1632	1633	1634	1649	1650	1651
	1665	1666	1667	1683	1685	1695	1696	1713	1716						
MTP1	472	538	562	583	600	613	631	646	667	680	693	707	725	737	760
	773	788	1028	1049	1067	1081	1099	1114	1136	1149	1160	1177	1196	1210	1232
	1248	1249	1493	1522	1539	1556	1576	1587	1606						
NOP	491	498													
RESET	1718														
RTI	462	473													
SCC	561	736	828	942	989	1027	1209	1268	1291	1404	1451				
S08	503	507	511	515											
SUB	456														
TST	457	547	571	618	655	746	775	797	851	885	916	978	1037	1086	1123
	1219	1255	1278	1314	1348	1379	1440	1469	1502	1544	1565	1639	1659	1675	1701
TSTB	1714														
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.MACRO	1														
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.REN	2														
.REPT	308														
.TITLE	210														
.WORD	438	440	442												

ERRORS DETECTED: 0  
DEFAULT GLOBALS GENERATED: 0

#,DFKTCA/SOL/CRF/PAGNUM=SYSMAC.SML(400,1066),DFKTCA(400,4571)  
RUN-TIME: 26 31 2 SECONDS  
RUN-TIME RATIO: 336/60=5.5  
CORE USED: 32K (63 PAGES)

