

# PDP11/34

MM ACCESS KEYS TEST  
MD-11-DFKTC-A

EP-DFKTC-A-DL-A  
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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 SSROT, 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 MTP1 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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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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; 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  
; \*\*\*\*\*

; SEGMENTATION REGISTER ADDRESS ASSIGNMENTS

SRO=177572  
SR1=177574  
SR2=177576

; ADDRESS OF SEGMENTATION REGISTER SRO  
; " " " " 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

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298				
299				
300	000006		;ACCESS CONTROL FIELD DEFINITIONS (IN PDR)	
301			RM=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	



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

```

452
453      000400          . =400
454
455      ;USER HALT TRAP SERVICE ROUTINE.
456      SHLT:  SUB    #2,(KSP)      ;ADJUST PC
457      TST   @2(KSP)      ;CHECK IF HLT CAUSED TRAP
458      BEQ   SHLTA
459      ADD   #2,(KSP)      ;RESTORE PC
460      JMP   6            ;GO HALT AT 6
461      SHLTA: BIC   #UM,2(KSP)    ;KERNEL MODE ON RETURN
462      RTI
463
464
465      ;SCOPE (EMT) SERVICE ROUTINE
466      SCOPEA: MOV   (KSP),R1      ;SAVE RETURN ADDRESS IN R1
467      MOV   #KPTR,KSP      ;SET KERNEL STACK PTR
468      CLR   -(KSP)
469      MOV   R1,-(KSP)
470      MOV   #UPTR,-(KSP)
471      MOV   #PUM,@#PSW      ;PREVIOUS USER MODE
472      MTP   USP            ;SET USER STACK PTR
473      RTI                ;RETURN & START NEXT TEST
474
475      ;SEGMENTATION ERROR SERVICE
476      MMERR: MOV   @#SRD,SSROT    ;SAVE SRD
477      CLR   @#SRD
478      JMP   @#MMVEC+2
479
480      001000          . =1000
481
482      ;TAGS
483      ICNT:  0            ;CONTAINS PASS COUNT
484      SSROT: 0            ;CONTAINS SSRO CONTENTS ON ERROR
485      TEMP:  0
486      . =.+6

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487									
488									
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	012703	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					

  

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      . = 1070
:START SEGMENTATION TEST-S5
START:  NOP
        CLR      ICNT
        CLR      @#PSW
BEGIN:  CLR      @#KPTR,KSP
        MOV      @#MMERR,@#MMVEC
        SCOPE
        MOV      @#MMVEC+2
        CLR      @#SRO
        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,KPAR6
        MOV      @#77406,KPAR7
        MOV      @#6,UPDR4
        MOV      @#6,UPDR5
        CLR      KPAR0
        MOV      @#167,KPAR6
        MOV      @#7600,KPAR7
        MOV      @#173,UPAR4
        MOV      @#172,UPAR5
: 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
: 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
527 ;TESTS KKO-KK16 TEST THE MTPI INSTRUCTION KERNEL MODE, PREV KERNEL MODE.
528 ;*****
529 016600 VIRT=16600 ;KERNEL VIRTUAL ADDRESS FOR THESE TESTS
530 016600 PHYS=16600 ;CORRESPONDING KERNEL PHYSICAL ADDRESS
531 ;*****
532
533 ;TEST THAT MTPI CAN LOAD A GENERAL REGISTER (R2)
534 001302 005016 CLR (KSP) ;PUT 0 ON KERNEL STACK
535 001304 012702 177777 MOV #1,R2 ;PRESET REGISTER
536 001310 005237 177572 INC #SR0 ;ENABLE MEMORY MANAG.
537
538 KKO: MTPI R2 ;R2+(KSP)+
539 001314 006602 MOV PSW,R3 ;SAVE STATUS RESULT
540 001316 016703 176454 CLR #SR0 ;DISABLE MEMORY MANAG.
541 001322 005037 177572 CMP #KPTR+2,KSP ;CHECK THAT STACK POPPED
542 001326 022706 001062 BEQ .+4
543 001332 001401 HLT ;ERROR! INCORRECT STACK PTR
544 001334 000000 CMPB #Z,R3 ;CHECK STATUS RESULT
545 001336 122703 000004 BEQ .+4
546 001342 001401 HLT ;ERROR! INCORRECT STATUS RESULT
547 001344 000000 TST R2 ;CHECK RESULT
548 001346 005702 BEQ .+4
549 001350 001401 HLT ;ERROR! INCORRECT RESULT
550 001352 000000 SCOPE
551 001354 104000
552
553 ;TEST THAT MTPI CAN LOAD KERNEL ADDRESS (VIRT)
554 ;DM=1
555
556 001356 005016 CLR (KSP) ;PUT 0 ON KERNEL STACK
557 001360 012702 016600 MOV #VIRT,R2 ;R2=VIRT ADDRESS
558 001364 012737 177777 016600 MOV #1,#PHYS ;PRESET DATA
559 001372 005237 177572 INC #SR0 ;ENABLE MEMORY MANAG.
560
561 KK1: SCC
562 001376 000277 MTPI (R2) ;VIRT+(KSP)+
563 001380 006612 MOV PSW,R3 ;SAVE STATUS RESULT
564 001384 016703 176370 CLR #SR0 ;DISABLE MEMORY MANAG.
565 001388 005037 177572 CMP #KPTR+2,KSP ;CHECK THAT STACK POPPED
566 001392 022706 001062 BEQ .+4
567 001396 000000 HLT ;ERROR! INCORRECT STACK PTR
568 001400 000000 CMPB #Z+0,R3 ;CHECK STATUS RESULT
569 001404 000000 BEQ .+4 ;ERROR! INCORRECT STATUS RESULT
570 001408 000000 TST #PHYS ;CHECK RESULT
571 001412 000000 HLT ;ERROR! INCORRECT RESULT
572

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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, PHY, -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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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    @#SRO        ;ENABLE MEMORY MANAG.
758
759
760 002420 006677 176360          KK15:  MTP1    @TEMP          ;VIRT+4+(KSP)+
761 002424 005037 177572          CLR    @#SRO        ;DISABLE MEMORY MANAG.
762 002430 005237 016604          INC    @#PHYS+4     ;CHECK RESULT
763 002434 001401                    BEQ    .+4
764 002436 000000                    HLT
765 002440 104000                SCOPE          ;ERROR INCORRECT RESULT
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    @#SRO        ;ENABLE MEMORY MANAG.
772
773 002456 006606                    KK16:  MTP1    KSP          ;KSP+(KSP)+
774 002460 005037 177572          CLR    @#SRO        ;DISABLE MEMORY MANAG.
775 002464 005706                    TST    KSP          ;CHECK STACK PTR
776 002466 001401                    BEQ    .+4
777 002470 000000                    HLT
778 002472 012706 001060          MOV    @KPTR,KSP   ;ERROR!
779 002476 104000                SCOPE          ;SET KERNEL STACK PTR
780
781                                ;TESTS KUO-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    @#SRO        ;ENABLE MEMORY MANAG.
787
788 002520 006602                    KUO:   MTP1    R2          ;R2+(KSP)+
789 002522 016703 175250          MOV    PSW,R3      ;SAVE STATUS RESULT
790 002526 005037 177572          CLR    @#SRO        ;DISABLE MEMORY MANAG.
791 002532 022706 001062          CMP    @KPTR+2,KSP ;CHECK THAT STACK POPPED
792 002536 001401                    BEQ    .+4
793 002540 000000                    HLT
794 002542 122703 000344          CMPB  @PTY7+Z,R3   ;ERROR! INCORRECT STACK PTR
795 002546 001401                    BEQ    .+4          ;CHECK STATUS RESULT
796 002550 000000                    HLT
797 002552 005702                    TST    R2           ;ERROR! INCORRECT STATUS RESULT
798 002554 001401                    BEQ    .+4          ;CHECK RESULT
799 002556 000000                    HLT
800 002560 104000                SCOPE          ;ERROR! INCORRECT RESULT
801
802                                ;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS KERNEL MODE.
803                                ;TEST THAT MFPI CAN GET DATA FROM A GENERAL REGISTER (R3)
804 002562 012767 000340 175206    MOV    @PTY7,PSW   ;KERNEL MODE!!!,PREV KERNEL MODE!!
805 002570 005066 177776          CLR    -2(KSP)
806 002574 012703 177777          MOV    @-1,R3     ;PRESET GENERAL REGISTER

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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	#PRTY7+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		KKF3:	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		KKF4:	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		KKF5:	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	KKF6:	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		CLP	PSW	
920	003312	104000			SCOPE		
921							
922							
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	#SRO	;ENABLE MEMORY MANAGEMENT
929	003350	00572	001010	KKF7:	MFPI	#TEMP+4(R2)	;-(KSP)+VIRT
930	003354	00537	177572		CLR	#SRO	;DISABLE MEMORY MANAGEMENT
931	003360	005216			INC	(KSP)	;CHECK RESULT
932	003362	001401			BEQ	.+4	
933	003364	000000			HLT		;ERROR! INCORRECT RESULT
934	003366	104000			SCOPE		
935							
936							
937							
938	003370	005067	174402		CLR	PSW	;KERNEL MODE!!!,PREV KERNEL MODE!!
939	003374	012706	001060		MOV	#KPTR,KSP	;SET KERNEL STACK PTR
940	003400	005056	177776		CLR	-2(KSP)	
941	003404	005237	177572		INC	#SRO	;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	#SRO	;DISABLE MEMORY MANAGEMENT
946	003424	122702	000001		CHPB	#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							
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	#SRO	;ENABLE MEMORY MANAGEMENT
964	003502	006537	016600	KKF11:	MFPI	#VIRT	;-(KSP)+VIRT
965	003506	005037	177572		CLR	#SRO	;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							
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      @#SRO      ;ENABLE MEMORY MANAGEMENT
976 003546 006567 013026          KKF12: MFPI     VIRT      ;-(KSP)+VIRT
977 003552 005037 177572          CLR      @#SRO      ;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
985 003572 005066 177776          CLR      PSW      ;KERNEL MODE!!!,PREV KERNEL MODE!!
986 003576 012737 016604 001004          CLR      -2(KSP)
987 003604 012737 177777 016604          MOV      @VIRT+4,@#TEMP ;LOAD ADDRESS
988 003612 005237 177572          MOV      @-1,@#PHYS+4 ;PRESET DATA
989 003616 000277          INC      @#SRO      ;ENABLE MEMORY MANAGEMENT
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      @#SRO      ;DISABLE MEMORY MANAGEMENT
993 003634 122702 000011          CMPB    @#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
1003 003662 005237 177572          MOV      @-1,-2(KSP)
1004 003666 006517          KKF14: INC      @#SRO      ;ENABLE MEMORY MANAGEMENT
1005 003670 000400          KKF14A: MFPI    (PC)      ;PUSH NEXT WORD ON THE STACK
1006 003672 005037 177572          BR       .+2         ;THIS DATA GOES ONTO THE STACK
1007 003676 023716 003670          CLR      @#SRO      ;DISABLE MEMORY MANAGEMENT
1008 003702 001401          CMP      @#KKF14A,(KSP) ;CHECK DATA ON THE STACK
1009 003704 000000          BEQ      .+4
1010 003706 104000          HLT      ;ERROR! INCORRECT DATA ON STACK
1011          SCOPE
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      @#SRO      ;ENABLE MEMORY MANAG.
1026
1027 003736 000277          SCC
1028 003740 006612          KU1:  MTP      (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: MTPI	(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: MTPI	@(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: MTPI	-(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								;DM=5
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	174E 4	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: MTPI	@-(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								;DM=6
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: MTPI	VIRT(R2)		;VIRT+2+(KSP)+
1115	004330	016700	173442		MOV	PSW,RO		;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,RO ;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								;DM=7
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: MTPI	@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 004450 012737 030000 177776 ;DM=0,PC MOV #KM+PUM,@#PSW ;KERNEL MODE!!!,PREV USER MODE!!
1146 004456 012716 004472 MOV #KUI0A,(KSP) ;PUT NEW PC ON STACK AS DATA
1147 004462 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1148
1149 004466 006607 KUI0: MTP1 PC ;PC+(KSP)+
1150 004470 000000 HLT ;ERROR! MTP1 DID NOT LOAD NEW PC
1151 004472 005037 177572 KUI0A: CLR @#SRO ;DISABLE MEMORY MANAG.
1152 004476 104000 SCOPE
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 #KUI1A,MMVEC ;LOAD SEG ERR VECTOR
1158 004520 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1159
1160 004524 006627 KUI1: MTP1 (PC)+ ;(PC)++(KSP)+, SHOULD ABORT
1161 004526 000000 HLT ;ERROR! DID NOT ABORT AND PC DID NOT
1162 ;AUTO-INCREMENT
1163 004530 000000 HLT ;ERROR! DID NOT ABORT
1164 004532 005037 177572 KUI1A: CLR @#SRO ;DISABLE MEMORY MANAG.
1165 004536 022706 001056 CMP #KPTR-2,KSP ;CHECK THAT STACK PTR WAS PUSHED TWICE
1166 004542 001401 BEQ .+4
1167 004544 000000 HLT ;ERROR! INCORRECT STACK PTR ON ERROR ABORT
1168 004546 012767 000462 173474 MOV #MMERR,MMVEC
1169 004554 104000 SCOPE
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 KUI2: MTP1 @#VIRT ;VIRT+(KSP)+
1178 004604 016700 173166 MOV PSH,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 ;ERROR! INCORRECT STATUS RESULT
1183 004624 005267 012350 INC PHYS ;CHECK RESULT
1184 004630 001401 BEQ .+4
1185 004632 000000 HLT ;ERROR! INCORRECT RESULT
1186 004634 005067 173136 CLR PSH
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 KUI3,R2 ;SAVE MTP1 INSTRUCTION
1193 004656 012767 004674 173364 MOV #KUI3A,MMVEC ;LOAD SEG ERR VECTOR
1194 004664 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1195
1196 004670 006647 KUI3: MTP1 -(PC) ;-(PC)++(KSP)+
1197 004672 000000 HLT ;ERROR! FAILED TO ABORT

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# M02

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1198	004674	005037	177572			;DISABLE MEMORY MANAG.
1199	004700	J10267	177764			;RESTORE INSTRUCTION
1200	004704	012767	000462	173336		;MMERR, MAVEC
1201	004712	104000				
1202						
1203						
1204	004714	012737	030340	177776		;DM=6,PC ;KERNEL MODE!!!,PREV USER MODE!!
1205	004722	005016				;PUT 0 ON KERNEL STACK
1206	004724	012767	177777	012252		
1207	004732	005237	177572			;ENABLE MEMORY MANAG.
1208						
1209	004736	000277				
1210	004740	006667	113040			
1211	004744	016703	173026			
1212	004750	005037	177572			
1213	004754	022706	001062			
1214	004760	001401				
1215	004762	000000				
1216	004764	122703	000345			
1217	004770	001401				
1218	004772	000000				
1219	004774	005737	017204			
1220	005000	001401				
1221	005002	000000				
1222	005004	104000				
1223						
1224						
1225						
1226	005006	012737	030000	177776		;KERNEL MODE!!!,PREV USER MODE!!
1227	005014	012716	177777			;PUT 0-1 ON KERNEL STACK
1228	005020	012737	120004	001004		;LOAD ADDRESS
1229	005026	005037	017204			;PRESET DATA
1230	005032	005237	177572			;ENABLE MEMORY MANAG.
1231						
1232	005036	006677	173742			
1233	005042	005037	177572			
1234	005046	005237	017204			
1235	005052	001401				
1236	005054	000000				
1237	005056	104000				
1238						
1239						
1240						
1241	005060	012737	030000	177776		;CHECK THAT MTP1 CAN SET USER STACK PTR & PUSH DATA ONTO USER STACK
1242	005066	012746	120000			;KERNEL MODE!!!,PREV USER MODE!!
1243	005072	005046				
1244	005074	012746	120000			
1245	005100	012737	177777	017200		
1246	005106	005237	177572			
1247						
1248	005112	006606				
1249	005114	006636				
1250	005116	005037	177572			
1251	005122	106506				
1252	005124	022716	120000			
1253	005130	001401				

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1254 005132 000000          HLT          ;ERROR! MTP1 USP FAILED
1255 005134 005700 017200  TST          @#PHYS      ;CHECK THAT MTP1 @ (KSP)+ PUT THE
1256 005140 001401          BEQ          .+4         ;CORRECT DATA ONTO THE USER STACK
1257 005142 000000          HLT          ;ERROR! MTP1 @ (KSP)+ FAILED
1258 005144 022706 001056  CMP          @#KPTR-2,KSP ;CHECK KERNEL STACK PTR AFTER TEST
1259 005150 001401          BEQ          .+4
1260 005152 000000          HLT          ;ERROR! INCORRECT KERNEL STACK PTR
1261 005154 104000          SCOPE
1262
1263          ;TEST MFPI INSTRUCTION KERNEL MODE PREVIOUS USER MODE
1264 005156 012767 030000 172612  MOV          @PUM,PSW      ;KERNEL MODE!!!,PREV USER MODE!!
1265 005164 012766 177777 177776  MOV          @-1,-2(KSP)
1266 005172 005000          CLR          R0          ;PRESET REGISTER
1267 005174 005237 177572  INC          @#SRO        ;ENABLE MEMORY MANAGEMENT
1268 005200 000277          SCC          ;PRESET CC'S
1269 005202 006500          MFPI        R0          ;-(KSP)+(R1)
1270 005204 016704 172566  MOV          PSW,R4        ;SAVE CC'S
1271 005210 005037 177572  CLR          @#SRO        ;DISABLE MEMORY MANAGEMENT
1272 005214 122704 000005  CMPB        @Z+C,R4 ;CHECK CC'S
1273 005220 001401          BEQ          .+4
1274 005222 000000          HLT          ;ERROR! INCORRECT CC'S
1275 005224 022706 001056  CMP          @#KPTR-2,KSP ;CHECK THAT STACK PTR WAS PUSHED
1276 005230 001401          BEQ          .+4
1277 005232 000000          HLT          ;ERROR! INCORRECT STACK PTR
1278 005234 005716          TST          (KSP)       ;CHECK RESULT
1279 005236 001401          BEQ          .+4
1280 005240 000000          HLT          ;ERROR! INCORRECT RESULT
1281 005242 005067 172530  CLR          PSW
1282 005246 104000          SCOPE
1283
1284          ;TEST THAT MFPI CAN GET DATA FROM A KERNEL VIRTUAL ADDRESS
1285          ;DM=1
1286 005250 012767 030000 172520  MOV          @KM+PUM,PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1287 005256 005066 177776          CLR          -2(KSP)
1288 005262 012702 120000          MOV          @VIRT,R2     ;R2=VIRTUAL ADDRESS
1289 005264 012737 177777 017200  MOV          @-1,@#PHYS    ;PRESET PHYSICAL ADDRESS
1290 005274 005237 177572  INC          @#SRO        ;ENABLE MEMORY MANAGEMENT
1291 005300 000277          SCC          ;PRESET CC'S
1292 005302 006512          MFPI        (R2)        ;-(KSP)+(R2)
1293 005304 016703 172466  MOV          PSW,R3        ;SAVE CC'S
1294 005310 005037 177572  CLR          @#SRO        ;DISABLE MEMORY MANAGEMENT
1295 005314 122703 000011  CMPB        @N+C,R3      ;CHECK CC'S
1296 005320 001401          BEQ          .+4
1297 005322 000000          HLT          ;ERROR! INCORRECT CC'S
1298 005324 022706 001056  CMP          @#KPTR-2,KSP ;CHECK THAT STACK WAS PUSHED
1299 005330 001401          BEQ          .+4
1300 005332 000000          HLT          ;ERROR! INCORRECT STACK PTR
1301 005334 005716          TST          (KSP)       ;CHECK RESULT
1302 005336 001401          BEQ          .+4
1303 005338 000000          HLT          ;ERROR! INCORRECT RESULT
1304 005340 104000          SCOPE
1305
1306          ;KERNEL MODE!!!,PREV USER MODE!!
1307          ;VIRTUAL ADDRESS

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1310	005364	005037	017200		CLR	@PHYS	: PRESET PHYSICAL ADDRESS
1311	005370	005237	177572		INC	@SR0	: ENABLE MEMORY MANAGEMENT
1312	005374	006522		KUF2:	MFPI	(R2)+	: -(KSP)+VIRT
1313	005376	005037	177572		CLR	@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,@TEMP	: LOAD ADDRESS
1328	005452	012737	177777	017202	MOV	@-1,@PHYS+2	: PRESET DATA
1329	005460	005237	177572		INC	@SR0	: ENABLE MEMORY MANAGEMENT
1330	005464	006532		KUF3:	MFPI	@(R2)+	: -(KSP)+VIRT+2
1331	005466	005037	177572		CLR	@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	@PHYS	: PRESET PHYSICAL ADDRESS DATA
1342	005526	005237	177572		INC	@SR0	: ENABLE MEMORY MANAGEMENT
1343	005532	006544		KUF4:	MFPI	-(R4)	: -(KSP)+VIRT
1344	005534	005037	177572		CLR	@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,@TEMP	: LOAD ADDRESS
1358	005604	012737	177777	017204	MOV	@-1,@PHYS+4	: PRESET PHYSICAL ADDRESS DATA
1359	005612	005237	177572		INC	@SR0	: ENABLE MEMORY MANAGEMENT
1360	005616	006551		KUF5:	MFPI	@-(R1)	: -(KSP)+VIRT+4
1361	005620	005037	177572		CLR	@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 000237 177572          INC    @#SRO         ;ENABLE MEMORY MANAGEMENT
1374 005670 000052 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 000057 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 000056 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 000237 177572          INC    @#SRO         ;ENABLE MEMORY MANAGEMENT
1392 005762 000572 001010  KUF7: MFPI  @TEMP+4(R2) ;-(KSP)+VIRT
1393 005766 000037 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
1400
1401 006002 012767 030000 171766 ;TEST THAT MFPI OPERATES PROPERLY US PC IN DESTINATION
1402 006010 000056 177776          ;DM=0,PC  MOV    #KM+PUM,PSW   ;KERNEL MODE!!!,PREV USER MODE!!
1403 006014 000037 177572          CLR    -2(KSP)
1404 006020 000077          INC    @#SRO         ;ENABLE MEMORY MANAGEMENT
1405 006032 006507          SCC
1406 006034 015702 171746  KUF10: MFPI  PC          ;-(KSP)+PC
1407 006036 000037 177572          MOV    PSW,R2       ;SAVE CC'S
1408 006038 012702 000001          CLR    @#SRO         ;DISABLE MEMORY MANAGEMENT
1409 006040 001401          CMPB   #C,R2        ;CHECK CC'S
1410 006042 000000          BEQ    .+4
1411 006044 022706 001056          HLT
1412 006050 001401          CMP    #KPTR-2,KSP  ;CHECK STACK PTR
1413 006052 000000          BEQ    .+4
1414 006054 022716 006024          HLT
1415 006060 001401          CMP    #KUF10+2,(KSP) ;ERROR! STACK NOT PUSHED
1416 006062 000000          BEQ    .+4          ;CHECK THAT PC WAS PUSHED ON THE STACK
1417 006064 104000          HLT
1418          SCOPE
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      @#SRO      ;ENABLE MEMORY MANAGEMENT
1426 006112 006537 120000      MFPI    @#VIRT      ;-(KSP)+VIRT
1427 006116 005037 177572      CLR      @#SRO      ;DISABLE MEMORY MANAGEMENT
1428 006122 005216      INC      (KSP)      ;CHECK RESULT
1429 006124 001401      BEQ     .+4
1430 006126 000000      HLT
1431 006130 104000      SCOPE      ;ERROR! INCORRECT RESULT
1432 006132 012767 030340 171636      :DM=6,PC
1433 006140 012766 177777 177776      MOV      @PUM+PRTY7,PSW ;KERNEL MODE!!!,PREV USER MODE!!
1434 006146 005037 017200      MOV      @-1,-2(KSP)
1435 006152 005237 177572      CLR      @#PHYS      ;PRESET PHYSICAL ADDRESS DATA
1436 006156 006567 111616      INC      @#SRO      ;ENABLE MEMORY MANAGEMENT
1437 006162 005037 177572      MFPI    VIRT      ;-(KSP)+VIRT
1438 006166 005716      CLR      @#SRO      ;DISABLE MEMORY MANAGEMENT
1439 006170 001401      TST     (KSP)      ;CHECK RESULT
1440 006172 000000      BEQ     .+4
1441 006174 104000      HLT      ;ERROR! INCORRECT RESULT
1442 006176 012767 030000 171572      :DM=7,PC
1443 006204 005066 177776      MOV      @KH+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1444 006210 012737 120004 001004      CLR      -2(KSP)
1445 006216 012737 177777 017204      MOV      @VIRT+4,@#TEMP ;LOAD ADDRESS
1446 006224 005237 177572      MOV      @-1,@#PHYS+4 ;PRESET DATA
1447 006230 000277      INC      @#SRO      ;ENABLE MEMORY MANAGEMENT
1448 006232 006577 172546      SCC
1449 006236 016702 171534      MFPI    @TEMP      ;-(KSP)+VIRT+4
1450 006242 005037 177572      MOV      PSW,R2      ;SAVE CC'S
1451 006246 122702 000011      CLR      @#SRO      ;DISABLE MEMORY MANAGEMENT
1452 006252 001401      CMPB   @N+C,R2      ;CHECK CC'S
1453 006254 000000      BEQ     .+4
1454 006256 005216      HLT      ;ERROR! INCORRECT CC'S
1455 006260 001401      INC      (KSP)      ;CHECK RESULT
1456 006262 000000      BEQ     .+4
1457 006264 104000      HLT      ;ERROR! INCORRECT RESULT ON STACK
1458 006266 012767 030000 171502      MOV      @KH+PUM,PSW  ;KERNEL MODE!!!,PREV USER MODE!!
1459 006274 012716 120000      MOV      @VIRT,(KSP)
1460 006300 005037 017200      CLR      @#PHYS
1461 006304 005237 177572      INC      @#SRO      ;ENABLE MEMORY MANAGEMENT
1462 006310 006576 000000      MFPI    @#(KSP)    ;-(KSP)+VIRT
1463 006314 005037 177572      CLR      @#SRO      ;DISABLE MEMORY MANAGEMENT
1464 006320 005737 001056      TST     @#KPTR-2   ;CHECK DATA ON THE STACK
1465 006324 001401      BEQ     .+4
1466 006326 000000      HLT      ;ERROR! INCORRECT DATA ON THE STACK
1467 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      MOV      #UPTR,USP      ;SET USER STACK PTR
1481 006336 000240      USRTST: NOP            ;BEGIN TESTS IN USER MODE
1482 006340 012767 077406 171232      MOV      #77406,UPOR0   ;RW,UP 200 BLOCKS
1483 006346 012767 077406 171242      MOV      #77406,UPOR7   ;RW,UP 200 BLOCKS
1484 006354 012767 007600 171274      MOV      #7600,UPAR7
1485
1486      ;TESTS U00-U06 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      #UM+PUM+PTY7,#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      U00: MTP1      R2          ;R2+(USP)+
1494 006404 016703 171366      MOV      PSW,R3        ;SAVE STATUS RESULT
1495 006410 005037 177572      CLR      @#SRO         ;DISABLE MEMORY MANAG.
1496 006414 022706 000602      CMP      #UPTR+2,USP   ;CHECK THAT STACK POPPED
1497 006420 001401      BEQ     .+4
1498 006422 000000      HLT
1499 006424 122703 000344      CMPB    #PTY7+Z,R3    ;ERROR! INCORRECT STACK PTR
1500 006430 001401      BEQ     .+4            ;CHECK STATUS RESULT
1501 006432 000000      HLT
1502 006434 005702      TST     R2            ;ERROR! INCORRECT STATUS RESULT
1503 006436 001401      BEQ     .+4            ;CHECK RESULT
1504 006440 000000      HLT
1505 006442 104000      SCOPE                ;ERROR! INCORRECT RESULT
1506
1507
1508      ;TEST THAT USER CAN LOAD USER ADDRESS (VIRT)
1509
1510      ;*****
1511      120000      VIRT=120000 ;USER VIRTUAL ADDRESS FOR THESE TESTS
1512      017200      PHYS=17200 ;CORRESPONDING PHYSICAL ADDRESS
1513      ;*****
1514
1515      ;DM=2
1516 006444 012737 170000 177776      MOV      #UM+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      U01: MTP1      (R2)+      ;VIRT+(USP)+
1523 006474 005037 177572      CLR      @#SRO         ;DISABLE MEMORY MANAG.
1524 006500 005237 017200      INC      @#PHYS       ;CHECK RESULT

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1526 006504 001401 BEQ .+4
1527 006506 000000 HLT ;ERROR! INCORRECT RESULT
1528 006510 022702 120002 CMP #VIRT+2,R2 ;CHECK AUTO-INCREMENT
1529 006514 001401 BEQ .+4
1530 006516 000000 HLT ;ERROR! AUTO-INCREMENT FAILED
1531 006520 005067 171252 CLR PSW
1532 006524 104000 SCOPE
1533 ;DM=4
1534 006526 012737 170000 177776 MOV #UM+PUM,@#PSW ;USER MODE!!!,PREV USER MODE!!
1535 006534 005016 CLR (USP)
1536 006536 012702 120002 MOV #VIRT+2,R4 ;LOAD ADDRESS
1537 006540 012737 177777 017200 MOV #-1,@#PHYS ;PRESET DATA
1538 006550 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1539 ;U2:
1540 006554 006644 MTPI -(R4) ;VIRT+(USP)+
1541 006556 005037 177572 CLR @#SRO ;DISABLE MEMORY MANAG.
1542 006562 022704 120000 CMP #VIRT,R4 ;CHECK AUTO-DECREMENT
1543 006570 003000 HLT .+4 ;ERROR! AUTO-DECREMENT FAILED
1544 006572 005737 017200 TST @#PHYS ;CHECK RESULT
1545 006576 001401 BEQ .+4
1546 006600 000000 HLT ;ERROR! INCORRECT RESULT
1547 006602 104000 SCOPE
1548 ;DM=6
1549 006604 012737 170000 177776 MOV #UM+PUM,@#PSW ;USER MODE!!!,PREV USER MODE!!
1550 006612 005016 CLR (USP)
1551 006614 012702 000002 MOV #2,R2 ;LOAD INDEX REGISTER
1552 006620 012767 177777 010354 MOV #-1,@#PHYS+2 ;PRESET DATA
1553 006626 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1554 ;U3:
1555 006632 006662 120000 MTPI VIRT(R2) ;VIRT+2+(USP)+
1556 006636 016700 171134 MOV PSW,R0 ;SAVE STATUS RESULT
1557 006642 005037 177572 CLR @#SRO ;DISABLE MEMORY MANAG.
1558 006646 022706 000602 CMP #UPTR+2,USP ;CHECK THAT STACK POINTER POPPED
1559 006652 001401 BEQ .+4
1560 006654 000000 HLT ;ERROR! INCORRECT STACK PTR
1561 006656 122700 000004 CMPB #Z,R0 ;CHECK STATUS RESULT
1562 006662 001401 BEQ .+4
1563 006664 000000 HLT ;ERROR! INCORRECT STATUS RESULT
1564 006666 005737 017202 TST @#PHYS+2 ;CHECK RESULT
1565 006672 001401 BEQ .+4
1566 006674 000000 HLT ;ERROR! INCORRECT RESULT
1567 006676 104000 SCOPE
1568 ;TEST THAT MTPI CAN LOAD PC
1569 ;DM=0,PC
1570
1571
1572 006700 012737 170000 177776 MOV #UM+PUM,@#PSW ;USER MODE!!!,PREV USER MODE!!
1573 006706 012716 006722 MOV #U4A,(USP) ;PUT NEW PC ON STACK AS DATA
1574 006712 005237 177572 INC @#SRO ;ENABLE MEMORY MANAG.
1575 ;U4:
1576 006716 006607 MTPI PC ;PC+(USP)+
1577 006720 000000 HLT ;ERROR! MTPI DID NOT LOAD PC
1578 006722 005037 177572 U4A: CLR @#SRO ;DISABLE MEMORY MANAG.
1579 006726 104000 SCOPE
1580

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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:    MTP1      @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,PO          ;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:    MTP1      @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! INCORPECT 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		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	000037	017200			CLR	@#PHYS	;PRESET PHYSICAL ADDRESS DATA
1653	007254	000237	177572			INC	@#SRO	;ENABLE MEMORY MANAGEMENT
1654	007260	000044			UUF4:	MFPI	-(R4)	;(USP)+VIRT
1655	007262	000037	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		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	007306	005037	017202			CLR	@#PHYS+2	;PRESET PHYSICAL ADDRESS DATA
1669	007332	005237	177572			INC	@#SRO	;ENABLE MEMORY MANAGEMENT
1670	007336	000562	120000		UUF6:	MFPI	VIRT(R2)	;(USP)+VIRT-2
1671	007342	000037	177572			CLR	@#SRO	;DISABLE MEMORY MANAGEMENT
1672	007346	0002706	000576			CMP	@UPTR-2,USP	;CHECK STACK PTR
1673	007352	001401				BEQ	.+4	
1674	007354	000000				HLT		;ERROR! INCORRECT STACK PTR
1675	007306	005716				TST	(USP)	;CHECK RESULT
1676	007350	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		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	005037	120000		UUF11:	MFPI	@#VIRT	;(USP)+VIRT
1688	007422	000037	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		

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

```

1693
1694
1695 007436 012767 170340 170332 ;DM=6,PC
1696 007444 012766 177777 177776 MOV #UM+PUM+PRTY7,PSW ;USER MODE!!! PREV USER MODE!!
1697 007452 005037 017200 CLR #A,-2(USP)
1698 007456 005237 177572 @#PHYS ;PRESET PHYSICAL ADDRESS DATA
1699 007462 005567 110312 UUF12: MFPI @#SRO ;ENABLE MEMORY MANAGEMENT
1700 007466 005037 177572 CLR @#SRO ;-(USP)+VIRT
1701 007472 005716 TST (USP) ;DISABLE MEMORY MANAGEMENT
1702 007474 001401 BEQ .+4 ;CHECK RESULT
1703 007476 000000 HLT ;ERROR! INCORRECT RESULT
1704 007500 104000 SCOPE
1705
1706 ;*****IMPORTANT NOTE*****
1707 ;NO CODE ALLOWED BETWEEN 16600-17776
1708
1709 007502 005067 170270 END: CLR PSW
1710 007503 005267 171266 INC ICNT ;INCREMENT PASS COUNT
1711 007512 005727 171262 001000 CMP ICNT,#1000
1712 007520 001402 BEQ DONE
1713 007572 000167 171350 JMP BEGIN ;RING BELL AFTER 1000
1714 007576 012767 000007 170032 DONE: MOV #7,TPB ;PASSES
1715 007584 105767 170024 TSTB TPS
1716 007540 100375 BPL .-4 ;MONITOR LOAD?
1717 007542 013702 000042 MOV #42,R2 ;NO, CONTINUE
1718 007546 001405 BEQ DONE1
1719 007550 000005 RESET
1720 007552 004712 LOGIC: JSR 7,(2) ;RETURN TO MONITOR
1721 007554 000240 NOP
1722 007556 000240 NOP
1723 007560 000240 NOP
1724 007562 000167 171302 DONE1: JMP START ;RESTART
1725 000001 .END

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LOGIC	007552	445	1719#											
MERR	000462	442	476#	496	1168	1200								
MVEC	= 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#	159*	1524*	1536*	1544	1553*	1565	1584*	1593*	1603*	1608*	1635*	1652*
		1668*	1685*	1697*										
PRTY4	= 000200	230#												
PRTY7	= 000340	229#	783	794	803	810	972	1060	1204	1216	1434	1488	1499	1695
PSW	= 177776	242#	471*	493*	539	563	577*	591*	624*	636*	640*	647	702*	708
		716*	720*	739	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
PUM	= 030000	1596*	1600*	1613*	1617	1632*	1645*	1649*	1665*	1678*	1683*	1695*	1708*	
		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								
RW	= 000006	300#												
RO	=%000000	214#	647*	652	708*	710	893*	897	1115*	1120	1178*	1180	1266*	1269
R1	=%000001	1557*	1562	1588*	1590									
R2	=%000002	215#	466*	469	1356*	1360								
		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					
R5	=%000005	219#												
SCOPE	= 104000	304#	495	550	574	592	605	621	637	658	672	686	699	717
		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							
SCOPEA	000432	440	466#											
SHLT	000400	438	456#											
SHLTA	000422	458	461#											
SLR	= 177774	243#												
SRO	= 177572	258#	476	477*	499*	536*	540*	559*	564*	581*	584*	598*	601*	611*



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CROSS REFERENCE TABLE -- USER SYMBOLS

UUS	006752	1587*													
UU6	007044	1606*													
VIRT	= 120000	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										
Z	= 000004	227*	544	568	652	743	794	1034	1120	1216	1272	1499	1562		
.	= 007566	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*	460*	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							



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CROSS REFERENCE TABLE -- MACRO NAMES

CCWEN	10
ENDCOM	10
ESCAPE	10
GETPRI	10
GETSWR	10
MULT	10
NEWTST	10
POP	10
PUSH	10
REPORT	10
SETPRI	10
SETUP	10
SKIP	10
SLASH	10
STARS	10
SWRSU	10
TYPBIN	10
TYPDEC	10
TYPNAM	10
TYPNUM	10
TYPPCS	10
TYP OCT	10
TYP TXT	10
SSESC	10
SSMENT	10
SSSKIP	10
.EQUAT	10
.HEADE	10
.KTLI	10
.SETUP	10
.SWRN:	10
.SACTI	10
.SAPT8	10
.SAPTH	10
.S. TY	10
.SASTA	10
.SCATC	10
.SCHTA	10
.SDB2D	10
.SDB2O	10
.SDIV	10
.SEOP	10
.SERRO	10
.SERRT	10
.SMULT	10
.SPOWE	10
.SRAND	10
.SRODE	10
.SROOC	10
.SREAD	10
.SR2AZ	10
.\$SAVE	10
.\$S82D	10
.\$S82O	10
.\$SCOP	10
.\$SIZE	10

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CROSS REFERENCE TABLE -- MACRO NAMES

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

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CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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	589 763 883 1035 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 477 584 685 780 892 977 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
OR OPL OR	541 1031 1496 544 1295 304 303 337 367 397 427 536 705 879 1051 1230 1403 1604	565 1054 1527 568 1408 598 309 339 369 399 429 559 713 896 1065 1234 1425 1608	598 1083 1541 652 1455 598 311 341 371 401 431 581 723 899 1069 1246 1428 1615	615 1117 1559 710 1499 615 313 343 373 403 433 585 734 910 1079 1267 1437 1625	649 1165 1619 743 1562 649 315 345 375 405 435 598 757 928 1097 1290 1450 1636	740 1213 1622 794 1590 740 317 347 377 407 437 602 762 931 1101 1301 1458 1653	791 1252 1642 810 810 791 319 349 379 409 439 611 771 941 1112 1311 1466 1669	813 1258 1656 832 832 813 321 351 381 411 411 629 786 963 1134 1329 1491 1686	835 1275 1672 946 946 835 323 353 383 413 413 633 806 966 1138 1332 1520 1689	854 1298 1710 993 993 854 325 355 385 415 415 644 816 975 1147 1342 1524 1698	882 1317 1345 1034 1120 882 327 357 387 417 417 665 827 988 1158 1359 1537 1709	913 1345 1376 1180 1180 913 329 359 389 419 419 669 838 996 1175 1362 1554 1709	949 1376 1376 1180 1180 949 331 361 391 421 421 678 848 1003 1183 1373 1574 1574	952 1411 1414 1216 1272 952 333 363 393 423 423 691 866 1025 1194 1391 1585 1585	1007 1414 1414 1272 1272 1007 335 365 395 425 425 696 869 1047 1207 1394 1593 1593
CMP CMPB	1031 1496 544 1295	1054 1527 568 1408	1083 1541 652 1455	1117 1559 710 1499	1165 1619 743 1562	1213 1622 794 1590	1252 1642 810 810	1258 1656 832 832	1275 1672 946 946	1298 1710 993 993	1317 1345 1034 1120	1317 1345 1034 1120	1376 1376 1180 1180	1411 1411 1216 1272	1414 1414 1272 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	321 351 381 411 411 629 786 963 1134 1329 1491 1686	323 353 383 413 413 633 806 966 1138 1332 1520 1689	325 355 385 415 415 644 816 975 1147 1342 1524 1698	327 357 387 417 417 665 827 988 1158 1359 1537 1709	329 359 389 419 419 669 838 996 1175 1362 1554 1709	331 361 391 421 421 678 848 1003 1183 1373 1574	333 363 393 423 423 691 866 1025 1194 1391 1585	335 365 395 425 425 696 869 1047 1207 1394 1593
INC JMP JSR MFPO MFPI	451 1719 1251 807 1312 1687	460 829 1330 1699 467 516 578 661 755 863 939	478 849 1343 1687 469 517 579 662 769 864 944	1712 867 1360 1687 470 518 594 663 778 865 960	1723 880 1374 1687 471 519 595 676 783 876 962	1653 897 1392 1687 476 520 596 689 785 877 972	1669 911 1405 1687 494 522 609 702 789 891 973	1686 929 1426 1686 496 523 610 703 803 893 986	1689 943 1438 1689 500 524 624 708 805 894 987	1698 964 1452 1698 501 525 625 720 808 895 991	1709 976 1467 1709 504 535 626 721 825 906 1002	1709 990 1467 1709 505 539 627 722 826 907 1021	1709 1004 1467 1709 508 557 640 728 830 908 1023	1709 1269 1467 1709 509 558 642 733 844 925 1024	1709 1292 1467 1709 512 563 643 738 845 926 1029
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	496 523 610 703 803 893 986	500 524 624 708 805 894 987	501 525 625 720 808 895 991	504 535 626 721 825 906 1002	504 539 627 722 826 907 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	1299	1293	1307	1308	1309	1324	1326	1327	1328
	1338	1339	1340	1354	1356	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						
MPI	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														
.ABS	208														
.ENABL	1														
.END	1725														
.LIST	1	209													
.MACRO	1														
.MLIST	1	449													
.REM	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)

