

# PDP11/45

11/45 REGISTERS  
CCKBHBO

AH-7813B-MC

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FICHE 1 OF 1

JUL 1978

**digital**

MADE IN USA

This block contains a vertical strip of 11/45 registers. Each register is a small table with multiple columns and rows of data, typical of a computer's internal state or diagnostic information. The registers are arranged in a single column on the left side of the page.

.REM %

IDENTIFICATION

PRODUCT CODE: AC-7812B-MC  
PRODUCT NAME: CCKBHBO 11/45 REGISTERS  
DATE CREATED: JUNE 1978  
MAINTAINER: DIAGNOSTIC GROUP  
AUTHOR: JOHN ADAMS  
REVISED: BY CLEM WALSH

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1.0 ABSTRACT

THIS IS A TEST OF ALL THE 11/45 HARDWARE REGISTERS (R10-15, SUPERVISOR STACK POINTER(R16), USER STACK POINTER(R17), AND THE MICRO BREAK REGISTER. THIS TEST INSURES THAT ALL BITS IN EACH OF THE REGISTERS CAN BE SET AND CLEARED PROPERLY.

2.0 REQUIREMENTS

2.1 EQUIPMENT

BASIC 11/45 SYSTEM

2.2 STORAGE

THIS PROGRAM USES 0 THRU 17500

2.3 PRELIMINARY PROGRAMS

DOAA THRU DOMA

3.0 LOADING PROCEDURE

LOAD PROGRAM USING ABS LOADER

4.0 STARTING PROCEDURE

LOAD ADDRESS 200. PRESS START. THE PROGRAM WILL LOOP AND RING BELL ON PASS COMPLETION.

5.0 OPERATING PROCEDURE

5.1 SWITCH SETTINGS

NONE

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

SCOPE IS A MOVE PC,R1 AND STORES THE PC+2 IN R1.

5.2.2 HLT

HLT IS A HALT INSTRUCTION.

6.0 ERRORS

ALL ERRORS WILL CAUSE A HALT TRAP AND INTERRUPT ERRORS WILL CAUSE A HALT AT VECTOR+2.

6.1 ERROR RECOVERY

PRESS CONTINUE TO PROCEED TO NEXT TEST

6.2 ERROR LOOPING

TO LOOP ON AN ERROR, PLACE A BRANCH TO THE PREVIOUS SCOPE INSTRUCTION IN PLACE OF THE HALT INSTRUCTION.

NOTE THAT IF THE ERROR IS INTERMITTANT THAT THE TEST WILL DROP THRU THE HALT AND PROCEED TO THE NEXT TEST.

THEREFORE, TO LOOP THE TEST CONTINUOUSLY REPLACE THE BEQ .+4 INSTRUCTION IMMEDIATELY PRECEDING THE HALT WITH A BRANCH BACK TO THE PREVIOUS SCOPE.

TO LOOP ON TRAP FAILURES, PATCH IN THE FOLLOWING ROUTINE AT THE ADDRESS OF THE TRAP VECTOR.

TRAPVEC: TRAPVEC+4  
TRAPVEC+2: 0  
TRAPVEC+4: 012716 ;MOVE SCOPE ADDRESS TO STACK  
TRAPVEC+6: ADDRESS ;ADDRESS OF PREVIOUS SCOPE  
TRAPVEC+10: 000006 ;RETURN TO TEST AT SCOPE

RESTORE ALL LOCATIONS BEFORE PROCEEDING TO NEXT TEST.

7.0 RESTRICTIONS  
NONE

8.0 MISCELLANEOUS  
ON TRAP ERRORS THE STACK POINTER(R6) WILL CONTAIN THE  
ADDRESS WHERE THE TRAP OCCURED.

8.1 EXECUTION TIME  
THIS PROGRAM TAKES ABOUT 1 MINUTE.

8.2 STACK POINTER  
THIS PROGRAM INITIALY SETS THE STACK POINTER AT 500.

LISTING

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.TITLE CCKBHBO 11/45 REGISTERS  
.NLIST MC,MD  
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.ABS

;TEST CCKBHB- THIS DIAGNOSTIC TESTS THAT ALL BITS IN THE NEW 11/45 REGISTERS  
;R10-R15, SUPERVISOR & USER STACK POINTER (SSP & USP), AND MICRO BREAK REGISTER  
;CAN BE SET AND CLEARED, AND ARE SELECTED PROPERLY.  
;NOTE: ALL PREREQUISITE INSTRUCTION TESTS SHOULD BE SUCCESSFULLY RUN  
;BEFORE THIS PROGRAM.  
;NOTE: R0-R7 REFERS TO CONVENTIONAL (11/20) REGISTERS AND R10-R17 REFERS TO  
;ADDITIONAL 11/45 REGISTERS. KSP,SSP,AND USP REFER TO THE KERNEL,SUPERVISOR,  
;AND USER STACK POINTERS.  
;STARTING PROCEEDURE  
; LOAD ADDRESS=200  
; PRESS START  
; KERNEL STACK POINTER IS AT 500  
; SUPERVISOR STACK POINTER IS AT 600  
; USER STACK POINTER IS AT 700  
; BELL WILL RING WHEN TEST IS COMPLETE

;REGISTER IDENTIFIERS THESE BITS IDENTIFY EACH REGISTER  
BIT0=1 ;REGISTER 0 IDENT  
BIT1=2 ; " 1 "  
BIT2=4 ; " 2 "  
BIT3=10 ; " 3 "  
BIT4=20 ; " 4 "  
BIT5=40 ; " 5 "  
BIT6=100 ; " 6 "  
BIT7=200 ; " 7 "

;UPPER SET  
BIT8=400 ;REGISTER 10 IDENT  
BIT9=1000 ; " 11 "  
BIT10=2000 ; " 12 "  
BIT11=4000 ; " 13 "  
BIT12=10000 ; " 14 "  
BIT13=20000 ; " 15 "  
BIT14=40000 ; " 16 "  
BIT15=100000 ; " 17 "

R0=%0  
R1=%1  
R2=%2  
R3=%3  
R4=%4  
R5=%5  
R6=%6  
R7=%7  
SP=%6  
KSP=%6  
SSP=%6  
USP=%6  
PC=%7

;KERNEL'S STACK POINTER  
;SUPERVISOR'S STACK POINTER  
;USER'S STACK POINTER

196	000000	R10=%0	
197	000001	R11=%1	
198	000002	R12=%2	
199	000003	R13=%3	
200	000004	R14=%4	
201	000005	R15=%5	
202	000006	R16=%6	
203	000007	R17=%7	
204			
205	000500	KPTR=500	;KERNEL'S INITIAL STACK POINTER
206	000600	SPTR=600	;SUPERVISOR'S INITIAL STACK POINTER
207	000700	UPTR=700	;USER'S INITIAL STACK POINTER
208		:REGISTER ADDRESSES	
209	177570	DISPLAY=177570	;ADDRESS OF CONSOLE DISPLAY REGISTER
210	177776	PSW=177776	;ADDRESS OF PROCESSOR STATUS WORD
211	177770	UBREAK=177770	;ADDRESS OF MICRO BREAK REGISTER
212	177564	TPCSR=177564	
213	177566	TPBUF=177566	
214	177570	SWR=177570	;ADDRESS OF CONSOLE SWITCH REGISTER
215	022626	POP2=22626	;CMP (6)+,(6)+ POPS 2 WORDS OFF STACK
216	010701	SCOPE=010701	;MOV PC,R1 (R11)
217	000000	HLT=0	
218		:VECTOR ADDRESSES	
219	000004	ERRVEC=4	;ADDRESS OF ERROR TRAP VECTOR
220	000014	TBITVEC=14	;ADDRESS OF 'T' BIT TRAP VECTOR
221	000030	EMTVEC=30	;ADDRESS OF EMT TRAP VECTOR
222	000034	TRAPVEC=34	;ADDRESS OF TRAP TRAP VECTOR
223		:BIT ASSIGNMENTS IN PSW	
224	000000	KM=0	;KERNEL MODE
225	040000	SM=40000	;SUPERVISORY MODE
226	140000	UM=140000	;USER MODE
227			
228			
229			
230			
231		:TRAP CATCHER FROM 0 TO 376	
232			
233	000000	. = 0	
234			
235			





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288
289
290          000200          .=200
291 000200 004767 003614   JSR   PC,CKMODE      ;CHECK FOR MODE OF OPERATION ++ C.W
292 000204 000167 000600   JMP   START
293
294          001000          .=1000
295 001000 000000          ICNT:0          ;PASS COUNT
296 001002 000000          TEMP:0
297 001010 001010          .=.+4
298 001010 005067 177764   START: CLR   ICNT
299 001014 016737 177760 177570 BEGIN: MOV   ICNT,@#DISPLAY ;DISPLAY PASS COUNT
300 001022 012706 000500   MOV   #KPTR,KSP      ;INITIALIZE THE STACK POINTER
301 001026 032737 000400 177570   BIT   #400,@#SWR     ;LOAD MICRO BREAK REGISTER?
302 001034 001403          BEQ   .+10
303 001036 113737 177570 177770   MOVB  @#SWR,@#UBREAK ;LOAD MICRO BREAK REG WITH SRO-7
304 001044 005067 176726   CLR   PSW
305          ;LOAD EACH REGISTER WITH ITS IDENTIFIER
306
307 001050 012700 000001   T0:   MOV   #BIT0,R0
308 001054 012701 000002   MOV   #BIT1,R1
309 001060 012702 000004   MOV   #BIT2,R2
310 001064 012703 000010   MOV   #BIT3,R3
311 001070 012704 000020   MOV   #BIT4,R4
312 001074 012705 000040   MOV   #BIT5,R5
313 001100 012767 004000 176670   MOV   #BIT11,PSW     ;SET REGISTER SET BIT
314 001106 012700 000400   MOV   #BIT8,R10
315 001112 012701 001000   MOV   #BIT9,R11
316 001116 012702 002000   MOV   #BIT10,R12
317 001122 012703 004000   MOV   #BIT11,R13
318 001126 012704 010000   MOV   #BIT12,R14
319 001132 012705 020000   MOV   #BIT13,R15
320
321 001136 005067 176634   CLR   PSW          ;SWITCH TO CONVENTIONAL REGISTERS
322
323          ;TEST THAT ALL REGISTERS WERE PROPERLY LOADED
324 001142 022700 000001   CMP   #BIT0,R0
325 001146 001401          BEQ   .+4
326 001150 000000          HLT
327 001152 022701 000002   CMP   #BIT1,R1
328 001156 001401          BEQ   .+4
329 001160 000000          HLT
330 001162 022702 000004   CMP   #BIT2,R2
331 001166 001401          BEQ   .+4
332 001170 000000          HLT
333 001172 022703 000010   CMP   #BIT3,R3
334 001176 001401          BEQ   .+4
335 001200 000000          HLT
336 001202 022704 000020   CMP   #BIT4,R4
337 001206 001401          BEQ   .+4
338 001210 000000          HLT
339 001212 022705 000040   CMP   #BIT5,R5
340 001216 001401          BEQ   .+4
341 001220 000000          HLT
342 001222 022706 000500   CMP   #KPTR,KSP
343 001226 001401          BEQ   .+4

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344 001230 000000
345 ;SWTICH TO UPPER REGISTERS
346 001232 012767 004000 176536 MOV #BIT11,PSW
347 001240 022700 000400 CMP #BIT8,R10
348 001244 001401 BEQ .+4
349 001246 000000 HLT
350 001250 022701 001000 CMP #BIT9,R11
351 001254 001401 BEQ .+4
352 001256 000000 HLT
353 001260 022702 002000 CMP #BIT10,R12
354 001264 001401 BEQ .+4
355 001256 000000 HLT
356 001270 022703 004000 CMP #BIT11,R13
357 001274 001401 BEQ .+4
358 001276 000000 HLT
359 001300 022704 010000 CMP #BIT12,R14
360 001304 001401 BEQ .+4
361 001306 000000 HLT
362 001310 022705 020000 CMP #BIT13,R15
363 001314 001401 BEQ .+4
364 001316 000000 HLT
365 ;R7 CHECK
366 001320 012707 001330 MOV #TOX,R17
367 001324 000000 HLT
368 001326 000000 HLT
369
370 001330 005067 176442 TOX: CLR PSW
371 001334 010701 SCOPE
372
373 ;CHECK THAT ALL BITS IN R10 CAN BE SET/CLEARED.
374 001336 012767 004000 176432 A0: MOV #BIT11,PSW
375 001344 012767 000020 177432 MOV #20,TEMP+2
376 001352 012700 000001 MOV #1,R10
377 001356 010067 177420 MOV R10,TEMP
378 001362 006367 177414 A0A: ASL TEMP
379 001366 006300 ASL R10
380 001370 020067 177406 CMP R10,TEMP
381 001374 001401 BEQ .+4
382 001376 000000 HLT
383 001400 005367 177400 DEC TEMP+2
384 001404 001366 BNE A0A
385 001406 010701 SCOPE
386
387 ;CHECK THAT ALL BITS IN R11 CAN BE SET/CLEARED.
388 001410 012767 004000 176360 A1: MOV #BIT11,PSW
389 001416 012767 000020 177360 MOV #20,TEMP+2
390 001424 012701 000001 MOV #1,R11
391 001430 010167 177346 MOV R11,TEMP
392 001434 006367 177342 A1A: ASL TEMP
393 001440 006301 ASL R11
394 001442 020167 177334 CMP R11,TEMP
395 001446 001401 BEQ .+4
396 001450 000000 HLT
397 001452 005367 177326 DEC TEMP+2
398 001456 001366 BNE A1A
399 001460 010701 SCOPE

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400
401      :CHECK THAT ALL BITS IN R12 CAN BE SET/CLEARED.
402 001462 012767 004000 176306 A2:  MOV  #BIT11,PSW
403 001470 012767 000020 177306      MOV  #20,TEMP+2
404 001476 012702 000001      MOV  #1,R12
405 001502 010267 177274      MOV  R12,TEMP
406 001506 006367 177270      A2A: ASL  TEMP
407 001512 006302      ASL  R12
408 001514 020267 177262      CMP  R12,TEMP
409 001520 001401      BEQ  .+4
410 001522 000000      HLT
411 001524 005367 177254      DEC  TEMP+2
412 001530 001366      BNE  A2A
413 001532 010701      SCOPE
414
415      :CHECK THAT ALL BITS IN R13 CAN BE SET/CLEARED.
416 001534 012767 004000 176234 A3:  MOV  #BIT11,PSW
417 001542 012767 000020 177234      MOV  #20,TEMP+2
418 001550 012703 000001      MOV  #1,R13
419 001554 010367 177222      MOV  R13,TEMP
420 001560 006367 177216      A3A: ASL  TEMP
421 001564 006303      ASL  R13
422 001566 020367 177210      CMP  R13,TEMP
423 001572 001401      BEQ  .+4
424 001574 000000      HLT
425 001576 005367 177202      DEC  TEMP+2
426 001602 001366      BNE  A3A
427 001604 010701      SCOPE
428
429      :CHECK THAT ALL BITS IN R14 CAN BE SET/CLEARED.
430 001606 012767 004000 176162 A4:  MOV  #BIT11,PSW
431 001614 012767 000020 177162      MOV  #20,TEMP+2
432 001622 012704 000001      MOV  #1,R14
433 001626 010467 177150      MOV  R14,TEMP
434 001632 006367 177144      A4A: ASL  TEMP
435 001636 006304      ASL  R14
436 001640 020467 177136      CMP  R14,TEMP
437 001644 001401      BEQ  .+4
438 001646 000000      HLT
439 001650 005367 177130      DEC  TEMP+2
440 001654 001366      BNE  A4A
441 001656 010701      SCOPE
442
443      :CHECK THAT ALL BITS IN R15 CAN BE SET/CLEARED.
444 001660 012767 004000 176110 A5:  MOV  #BIT11,PSW
445 001666 012767 000020 177110      MOV  #20,TEMP+2
446 001674 012705 000001      MOV  #1,R15
447 001700 010567 177076      MOV  R15,TEMP
448 001704 006367 177072      A5A: ASL  TEMP
449 001710 006305      ASL  R15
450 001712 020567 177064      CMP  R15,TEMP
451 001716 001401      BEQ  .+4
452 001720 000000      HLT
453 001722 005367 177056      DEC  TEMP+2
454 001726 001366      BNE  A5A
455 001730 010701      SCOPE

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512 002226 012767 004000 175542 T6:  MOV  #BIT11,PSW
513 002234 012767 002276 175552      MOV  #T6A,TBITVEC
514 002242 005067 175550      CLR  TBITVEC+2
515 002246 052767 000020 175522      BIS  #BIT4,PSW          ;ATTEMPT TO SET 'T' BIT
516 002254 016767 175516 176520      MOV  PSW,TEMP
517 002262 022767 004004 176512      CMP  #BIT11+BIT2,TEMP; 'T'BIT SHOULD NOT HAVE SET
518 002270 001404      BEQ  T6X                ;'Z' WAS SET BY CLR TBITVEC+2 INST.
519 002272 000000      HLT                                ;ERROR! ONLY BIT11 & Z SHOULD BE SET
520 002274 000402      BR   T6X
521 002276 000000      T6A: HLT                ;ERROR! 'T' BIT CAUSED A TRAP
522 002300 022626      POP2
523 002302 010701      T6X: SCOPE
524
525 002304 012767 002344 175502 T7:  MOV  #T7A,TBITVEC
526 002312 012767 004000 175456      MOV  #BIT11,PSW
527 002320 012705 004020      MOV  #BIT11+BIT4,R15
528 002324 074567 175446      XOR  R15,PSW
529 002330 016767 175442 176444      MOV  PSW,TEMP
530 002336 001404      BEQ  T7X
531 002340 000000      HLT
532 002342 000402      BR   T7X
533 002344 000000      T7A: HLT
534 002346 022626      POP2
535 002350 012767 000016 175436 T7X: MOV  #16,14
536 002356 010701      SCOPE
537
538 002360 012767 004000 175410 T10: MOV  #BIT11,PSW
539 002366 012705 004000      MOV  #BIT11,R15
540 002372 074567 175400      XOR  R15,PSW
541 002376 074567 175374      XOR  R5,PSW
542 002402 016767 175370 176372      MOV  PSW,TEMP
543 002410 022767 000040 176364      CMP  #BIT5,TEMP
544 002416 001401      BEQ  .+4
545 002420 000000      HLT
546 002422 010701      SCOPE
547
548 002424 012767 004000 175344 T11: MOV  #BIT11,PSW
549 002432 005000      CLR  R10
550 002434 010067 176342      MOV  R10,TEMP
551 002440 001401      BEQ  .+4
552 002442 000000      HLT
553 002444 010701      SCOPE
554
555 002446 012767 004000 175322 T12: MOV  #BIT11,PSW
556 002454 005000      CLR  R10
557 002456 012767 000200 176316      MOV  #BIT7,TEMP
558 002464 116700 176312      MOVB TEMP,R10          ;MOVB TO A REG. EXTENDS SIGN
559 002470 020027 177600      CMP  R10,#177600      ;DID SIGN EXTEND
560 002474 001401      BEQ  .+4
561 002476 000000      HLT
562 002500 012700 000400      MOV  #BIT8,R10
563 002504 010701      SCOPE
564
565 002506 012767 004000 175262 T13: MOV  #BIT11,PSW
566 002514 012701 177777      MOV  #-1,R11
567 002520 010167 176256      MOV  R11,TEMP

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568 002524 026727 176252 177777      CMP      TEMP,#-1
569 002532 001401                    BEQ      .+4
570 002534 000000                    HLT
571 002536 010701                    SCOPE
572
573                                     ;TEST THAT MOVB TO A REGISTER EXTENDS THE SIGN (SIGN = 0)
574 002540 012767 004000 175230 T14:    MOV      #BIT11,PSW
575 002546 012701 177777          MOV      #-1,R11
576 002552 012767 017777 176222    MOV      #17777,TEMP
577 002560 116701 176217          MGVB    TEMP+1,R11
578 002564 022701 000037          CMP      #37,R11
579 002570 001401                    BEQ      .+4
580 002572 000000                    HLT
581 002574 012701 001000          MOV      #BIT9,R11
582 002600 010701                    SCOPE
583
584                                     ;TEST THAT XOR %R,%R OPERATES PROPERLY
585 002602 012767 004000 175166 T15:    MOV      #BIT11,PSW
586 002610 074203                    XOR      R12,R13
587 002612 010367 176164          MOV      R13,TEMP
588 002616 026727 176160 006000    CMP      TEMP,#BIT10+BIT11
589 002624 001401                    BEQ      .+4
590 002626 000000                    HLT
591 002630 012703 004000          MOV      #BIT11,R13
592 002634 010701                    SCOPE
593
594                                     ;TEST SOB WITH UPPER REGISTER SET
595 002636 012767 004000 175132 T16:    MOV      #BIT11,PSW
596 002644 012704 000001          MOV      #1,R14
597 002650 000402                    BR      T16B
598 002652 000000                    T16A:   HLT
599 002654 000401                    BR      T16X
600 002656 077403                    T16B:   SOB      R14,T16A
601 002660 012704 010000          T16X:   MOV      #BIT12,R14
602 002664 010701                    SCOPE
603
604                                     ;TEST ADD %R,%R USING UPPER REGISTER SET
605 002666 060302                    T17:    ADD      R13,R12
606 002670 010267 176106          MOV      R12,TEMP
607 002674 022767 006000 176100    CMP      #BIT10+BIT11,TEMP
608 002702 001401                    BEQ      .+4
609 002704 000000                    HLT
610 002706 012702 002000          MOV      #BIT10,R12
611 002712 010701                    SCOPE
612
613                                     ;TEST UPPER REGISTER SET (R13) IN AUTO INCREMENT MODE.
614 002714 005067 176064          T20:    CLR      TEMP+2      ;PRE SET MEMORY ADDRESS
615 002720 012767 177777 176054    MOV      #-1,TEMP
616 002726 012767 004000 175042    MOV      #BIT11,PSW      ;SWITCH TO UPPER REG. SET
617 002734 012703 001002          MOV      #TEMP,R13      ;LOAD REGISTER
618 002740 012367 176040          MOV      (R13)+,TEMP+2  ;MOVE TEMP TO TEMP+2
619 002744 022767 177777 176032    CMP      #-1,TEMP+2     ;WAS TEMP MOVED
620 002752 001401                    BEQ      .+4
621 002754 000000                    HLT      ;ERROR!
622 002756 022703 001004          CMP      #TEMP+2,R13    ;DID R13 INCREMENT
623 002762 001401                    BEQ      .+4
  
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624 002764 000000          HLT          ;ERROR! R13 DID NOT AUTO-INCREMENT
625 002766 010701          SCOPE
626
627          ;TEST UPPER REG. SET (R14) IN AUTO-DECREMENT MODE
628 002770 012767 001002 176006 T20A:  MOV    #TEMP,TEMP+2
629 002776 005067 176000      CLR    TEMP
630 003002 012767 004000 174766      MOV    #BIT11,PSW
631 003010 012704 001006      MOV    #TEMP+4,R14
632 003014 014467 175762      MOV    -(R14),TEMP
633 003020 022767 001002 175754      CMP    #TEMP,TEMP
634 003026 001401          BEQ    .+4
635 003030 000000          HLT
636 003032 022704 001004      CMP    #TEMP+2,R14      ;DID REGISTER AUTO-DECREMENT
637 003036 001401          BEQ    .+4
638 003040 000000          HLT
639 003042 010701          SCOPE
640
641          ;TESTS 21 AND 22 HAVE BEEN DELETED.
642
643          ;TEST UPPER REGISTER SET REGISTERS AS INDEX REGISTERS
644 003044 000240      T23:  NOP          ;THIS LOCATION MAY BE USED TO CLEAR
645          ;REGISTER SET BIT.
646 003046 012767 001002 175730      MOV    #TEMP,TEMP+2
647 003054 012767 177777 175720      MOV    #-1,TEMP
648 003062 012702 177776      MOV    #-2,R12          ;LOAD INDEX
649 003066 010205      MOV    R12,R15          ;REGISTERS
650 003070 067275 001006 001006      ADD    @TEMP+4(2),@TEMP+4(5) ;ADD TEMP (TEMP+4(5) TO ITSELF
651 003076 103401          BCS    .+4              ;-1,+1 RESULTS IN CARRY
652 003100 000000          HLT
653 003102 022767 177776 175672      CMP    #177776,TEMP    ;RESULT CORRECT
654 003110 001401          BEQ    .+4
655 003112 000000          HLT
656 003114 010701          SCOPE
657
658          ;TEST THAT ALL THREE STACK POINTERS (KSP,SSP,AND USP CAN BE SELECTED.
659 003116 012767 000000 174652      T24:  MOV    #KM,PSW      ;KERNEL MODE!!!
660 003124 012706 000500          MOV    #KPTR,KSP      ;LOAD KERNEL STACK POINTER
661 003130 052767 040000 174640      BIS    #SM,PSW        ;SUPERVISORY MODE!!!
662 003136 012706 000600          MOV    #SPTR,SSP      ;LOAD SUPERVISOR STACK POINTER
663 003142 052767 140000 174626      BIS    #UM,PSW        ;USER MODE!!!
664 003150 012706 000700          MOV    #UPTR,USP      ;LOAD USER STACK POINTER
665 003154 010667 175622          MOV    USP,TEMP        ;GET USER STACK POINTER
666 003160 042767 100000 174610      BIC    #BIT15,PSW     ;SUPERVISORY MODE!!!
667 003166 010667 175612          MOV    SSP,TEMP+2     ;GET SUPERVISOR STACK POINTER
668 003172 005067 174600          CLR    PSW            ;KERNEL MODE
669 003176 022706 000500          CMP    #KPTR,KSP      ;CHECK KERNEL STACK POINTER
670 003202 001401          BEQ    .+4
671 003204 000000          HLT          ;ERROR! KERNEL STACK POINTER NOT LOADED
672
673 003206 022767 000600 175570      CMP    #SPTR,TEMP+2   ;CHECK SUPERVISOR STACK POINTER
674 003214 001401          BEQ    .+4
675 003216 000000          HLT          ;ERROR! SUPERVISOR STACK NOT LOADED
676
677 003220 022767 000700 175554      CMP    #UPTR,TEMP     ;CHECK USER STACK POINTER
678 003226 001401          BEQ    .+4
679 003230 000000          HLT          ;ERROR! USER STACK POINTER NOT LOADED

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680 003232 010701          SCOPE
681
682          ;TEST THAT JSR INST. OPERATES PROPERLY WITH REG. SET BIT SET
683 003234 012706 000500    T25:  MOV   #KPTR,KSP      ;INITIALIZE THE STACK POINTER
684 003240 012700 000001    MOV   #BIT0,R0      ;PRE SET R0
685 003244 012767 004000 174524  MOV   #BIT11,PSW   ;SET REG. SET BIT
686 003252 012700 000400    MOV   #BIT8,R10    ;PRE SET R10
687 003256 004067 000002    JSR   R10,T25B     ;GO TO T25B & SAVE R10 ON THE STACK
688 003262 000000    T25A: HLT                ;JSR DID NOT GO
689 003264 022706 000476    T25B: CMP   #KPTR-2,KSP
690 003270 001401    BEQ   .+4          ;STACK POINTER DID NOT DECREMENT
691 003272 000000    HLT
692 003274 022767 000400 175174  CMP   #BIT8,KPTR-2 ;WAS OLD CONTENTS OF R10 SAVED?
693 003302 001401    BEQ   .+4
694 003304 000000    HLT                ;ERROR! R10 NOT SAVED ON THE STACK
695 003306 022700 003262    CMP   #T25A,R10    ;IS RETURN ADDRESS IN R10
696 003312 001401    BEQ   .+4
697 003314 000000    HLT                ;ERROR! RETURN ADRS. NOT SAVED IN R10
698 003316 005067 174454    CLR   PSW
699 003322 022700 000001    CMP   #BIT0,R0    ;R0 LEFT UNCHANGED?
700 003326 001401    BEQ   .+4
701 003330 000000    HLT                ;R0 GOT CHANGED
702 003332 010701          SCOPE
703
704          ;TEST JSR INSTRUCTION USING UPPER REG SET IN DEST. CALCULATION
705 003334 012706 000500    T26:  MOV   #KPTR,KSP
706 003340 012705 000040    MOV   #BIT5,R5    ;PRE SET R5
707 003344 012767 004000 174424  MOV   #BIT11,PSW  ;SWITH TO UPPER REG. SET
708 003352 005005    CLR   R15         ;PRE SET R15
709 003354 004565 003362    JSR   R15,T26B(5) ;GO TO T26B
710 003360 000000    T26A: HLT                ;ERROR! JSR FAILED
711 003362 005767 175110    T26B: TST   KPTR-2  ;OLD CONTENTS OF R15 SAVED?
712 003366 001401    BEQ   .+4
713 003370 000000    HLT                ;ERROR! OLD CONTENTS OF R15 NOT SAVED
714 003372 022705 003360    CMP   #T26A,R15   ;RETURN ADDRESS IN R15?
715 003376 001401    BEQ   .+4
716 003400 000000    HLT                ;ERROR! R15 DID NOT GET RETURN ADDRESS
717 003402 005067 174370    CLR   PSW         ;SWITCH TO LOWER REGISTERS
718 003406 022705 000040    CMP   #BIT5,R5    ;DID R5 CHANGE?
719 003412 001401    BEQ   .+4
720 003414 000000    HLT                ;ERROR! R5 GOT CHANGED
721 003416 010701          SCOPE
722
723          ;TEST RTS WITH UPPER REGISTERS
724 003420 012706 000500    T27:  MOV   #KPTR,KSP
725 003424 012716 001000    MOV   #BIT9,(KSP)
726 003430 012702 000004    MOV   #BIT2,R2    ;PRE SET R2
727 003434 012767 004000 174334  MOV   #BIT11,PSW  ;SWITCH TO UPPER REG. SET
728 003442 012702 003452    MOV   #T27A,R12   ;LOAD REG. WITH RETURN ADDRESS
729 003446 000202    RTS   R12         ;RETURN TO T27A (R12)
730 003450 000000    HLT                ;ERROR! RTS FAILED
731 003452 022706 000502    T27A: CMP   #KPTR+2,KSP ;WAS STACK POINTER INCREMENTED
732 003456 001401    BEQ   .+4
733 003460 000000    HLT                ;ERROR! STACK POINTER WAS NOT INCREMENTED
734 003462 022702 00 000    CMP   #BIT9,R12  ;WAS R12 RESTORED?
735 003466 001401    BEQ   .+4
  
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736 003470 000000          HLT          ;ERROR! RTS DID NOT RESTORE R12
737 003472 005067 174300    CLR          PSW          ;SWITCH TO LOWER REG. SET
738 003476 022702 000004    CMP          #BIT2,R2     ;DID R2 CHANGE?
739 003502 001401          BEQ          .+4
740 003504 000000          HLT          ;ERROR! R2 CHANGED
741 003506 010701          SCOPE
742
743          ;CHECK THAT ALL BITS IN KSP CAN BE SET/CLEARED.
744 003510 012700 000001    MOV          #1,R0        ;GET '1' BIT
745 003514 012767 000000 174254 T30:  MOV          #KM,PSW
746 003522 010006          MOV          R0,KSP      ;LOAD KSP
747 003524 010602          MOV          KSP,R2      ;GET RESULT
748 003526 005067 174244    CLR          PSW          ;KERNEL MODE!!!
749
750 003532 020200          CMP          R2,R0        ;WAS KSP LOADED CORRECTLY?
751 003534 001401          BEQ          .+4
752 003536 000000          HLT
753 003540 006300          ASL          R0          ;SHIFT '1' BIT THRU KSP
754 003542 103364          BCC          T30        ;UNTIL ALL BITS ARE TESTED
755 003544 010701          SCOPE
756
757          ;CHECK THAT ALL BITS IN SSP CAN BE SET/CLEARED.
758 003546 012700 000001    MOV          #1,R0        ;GET '1' BIT
759 003552 012767 040000 174216 T31:  MOV          #SM,PSW
760 003560 010006          MOV          R0,SSP      ;LOAD SSP
761 003562 010602          MOV          SSP,R2      ;GET RESULT
762 003564 005067 174206    CLR          PSW          ;KERNEL MODE!!!
763
764 003570 020200          CMP          R2,R0        ;WAS SSP LOADED CORRECTLY?
765 003572 001401          BEQ          .+4
766 003574 000000          HLT
767 003576 006300          ASL          R0          ;SHIFT '1' BIT THRU SSP
768 003600 103364          BCC          T31        ;UNTIL ALL BITS ARE TESTED
769 003602 010701          SCOPE
770
771          ;CHECK THAT ALL BITS IN USP CAN BE SET/CLEARED.
772 003604 012700 000001    MOV          #1,R0        ;GET '1' BIT
773 003610 012767 140000 174160 T32:  MOV          #UM,PSW
774 003616 010006          MOV          R0,USP      ;LOAD USP
775 003620 010602          MOV          USP,R2      ;GET RESULT
776 003622 005067 174150    CLR          PSW          ;KERNEL MODE!!!
777
778 003626 020200          CMP          R2,R0        ;WAS USP LOADED CORRECTLY?
779 003630 001401          BEQ          .+4
780 003632 000000          HLT
781 003634 006300          ASL          R0          ;SHIFT '1' BIT THRU USP
782 003636 103364          BCC          T32        ;UNTIL ALL BITS ARE TESTED
783 003640 010701          SCOPE
784
```

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785
786 ;CHECK THAT ALL BITS IN THE MICRO BREAK REGISTER (177770) CAN BE SET
787 ;AND CLEARED
788 003642 012700 000001 T33: MOV #1,R0
789 003646 012702 177770 T33: MOV #UBREAK,R2 ;GET ADDRESS OF MICRO BREAK REGISTER
790 003652 010012 T33A: MOV R0,(R2) ;LOAD TEST BIT INTO REGISTER
791 003654 011203 ;GET RESULT
792 003656 020003 ;COMPARE RESULT & TEST BIT
793 003660 001401 BEQ .+4
794 003662 000000 HLT ;ERROR! TEST BIT (R0) DID NOT SET INTO
795 ;REGISTER
796 003664 040012 BIC R0,(R2) ;CLEAR TEST BIT IN REGISTER
797 003666 011203 MOV (R2),R3 ;GET RESULT
798 003670 001401 BEQ .+4
799 003672 000000 HLT ;ERROR! TEST BIT DID NOT GET CLEARED
800 003674 106300 ASLB R0 ;SHIFT TEST BIT UNTIL DONE
801 003676 103365 BCC T33A
802 003700 010701 SCOPE
803
804 ;CHECK THAT RESET DOES NOT CLEAR MICRO BREAK REGISTER
805 003702 012737 177777 177770 T34: MOV #-1,@#UBREAK ;SET ALL 1'S INTO REGISTER
806 003710 122737 177777 177770 CMPB #-1,@#UBREAK ;CHECK RESULT
807 003716 001401 BEQ .+4
808 003720 000000 HLT ;ERROR!
809 003722 000005 RESET ;RESET DOES NOT CLEAR REGISTER
810 003724 122737 177777 177770 CMPB #-1,@#UBREAK ;CHECK THAT RESET DID NOT CLEAR ANY BITS
811 003732 001401 BEQ .+4
812 003734 000000 HLT ;ERROR!
813 003736 010701 SCOPE
814
815 003740 005267 175034 END: INC ICNT ;INCREMENT PASS COUNT
816 003744 026727 175030 001000 CMP ICNT,#1000 ;1000 PASSES?
817 003752 001402 BEQ 1$
818 003754 000167 175034 JMP BEGIN
819 003760 012767 000007 173600 1$: MOV #7,TPBUF ;RING THE BELL
820 003766 105767 173572 TSTB TPCSR ;WAIT FOR THE BELL
821 003772 100375 BPL .-4 ;TO RING
822 003774 013702 000042 MOV @#42,R2 ;GET DECTAPE MONITOR RETURN ADDRESS
823 004000 001405 BEQ DONE1 ;DO NOT RETURN IF (42)=0
824 004002 000005 RESET ;CLEAR THE WORLD
825 004004 004712 SENDAD: JSR PC,(R2) ;RETURN TO DECTAPE MONITOR
826 004006 000240 NOP ;ACT11
827 004010 000240 NOP ;OVERLAY
828 004012 000240 NOP ;AREA
829 004014 000167 174770 DONE1: JMP START ;RESTART TEST
830
831
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```
832
833 : *****
834 :                               MODIFIED FEB 28 1978
835 :
836 : ++
837 :                               CHECK FOR DUMP MODE OR AUTOMATIC/ACT11-XXDP MODE
838 : --
839
840 004020 005067 174054 CKMODE: CLR AUTOM ;INIT AUTOMATIC MODE INDICATOR
841 004024 105067 174052 CLRB ACT11M ;INIT ACT11 AUTO MODE INDICATOR
842 004030 105067 174047 CLRB XXDPM ;INIT XXDP AUTO MODE INDICATOR
843 004034 105067 174044 CLRB ADUMPM ;INIT ACT11 DUMP MODE INDICATOR
844 004040 105067 174041 CLRB XDUMPM ;INIT XXDP DUMP MODE INDICATOR
845 004044 005737 000042 TST @#42 ;AUTO MODE?
846 004050 001414 BEQ 2$ ;BRANCH - IF NO
847 004052 005267 174022 INC AUTOM ;SET AUTO MODE INDICATOR
848 004056 023737 000042 000046 CMP @#42,@#46 ;ACT11 MODE?
849 004064 001403 BEQ 1$ ;BRANCH - IF YES
850 004066 105267 174011 INCB XXDPM ;INDICATE XXDP AUTO MODE
851 004072 000413 BR 5$ ;AND EXIT
852 004074 105267 174002 1$: INCB ACT11M ;INDICATE ACT11 MODE
853 004100 000410 BR 5$ ;AND EXIT
854 004102 105737 000041 2$: TSTB @#41 ;MAN/MODE VIA ACT11/PAPER TAPE?
855 004106 001003 BNE 3$ ;BRANCH - IF NO
856 004110 105267 173770 INCB ADUMPM ;INDICATE MAN/MODE VIA ACT11/PAPER TAPE
857 004114 000402 BR 5$ ;AND EXIT
858 004116 105267 173763 3$: INCB XDUMPM ;INDICATE MANUAL MODE VIA XXDP
859 004122 005737 000042 5$: TST @#42 ;AUTO MODE?
860 004126 001002 BNE 6$ ;BRANCH - IF YES
861 004130 105067 173746 CLRB ACT11M ;RE-INIT ACT FLAG
862 004134 000207 6$: RTS PC ;RETURN
863
864 : *****
865
866 000001 .END
```

ACT11M	000102	281#	841*	852*	861*												
ADUMPM	000104	283#	843*	856*													
AUTOM	000100	280#	840*	847*													
A0	001336	374#															
AOA	001362	378#	384														
A1	001410	388#															
A1A	001434	392#	398														
A2	001462	402#															
A2A	001506	406#	412														
A3	001534	416#															
A3A	001560	420#	426														
A4	001606	430#															
A4A	001632	434#	440														
A5	001660	444#															
A5A	001704	448#	454														
BEGIN	001014	299#	818														
BIT0 =	000001	163#	307	324	471	684	699										
BIT1 =	000002	164#	308	327													
BIT10 =	002000	175#	316	353	461	588	607	610									
BIT11 =	004000	176#	313	317	346	356	374	388	402	416	430	444	458	462			
		468	479	486	495	503	512	517	526	527	538	539	548	555			
		565	574	585	588	591	595	607	616	630	685	707	727				
BIT12 =	010000	177#	318	359	463	601											
BIT13 =	020000	178#	319	362	464												
BIT14 =	040000	179#															
BIT15 =	100000	180#	666														
BIT2 =	000004	165#	309	330	490	499	517	726	738								
BIT3 =	000010	166#	310	333	507												
BIT4 =	000020	167#	311	336	515	527											
BIT5 =	000040	168#	312	339	543	706	718										
BIT6 =	000100	169#															
BIT7 =	000200	170#	557														
BIT8 =	000400	173#	314	347	459	562	686	692									
BIT9 =	001000	174#	315	350	460	581	725	734									
CKMODE	004020	291	840#														
DISPLA=	177570	209#	299*														
DONE1	004014	823	829#														
DRIVE	000040	247#															
EMTVEC=	000030	221#															
END	003740	815#															
ERRVEC=	000004	219#															
HLT =	000000	217#	326	329	332	335	338	341	344	349	352	355	358	361			
		364	367	368	382	396	410	424	438	452	473	476	483	492			
		501	509	519	521	531	533	545	552	561	570	580	590	598			
		609	621	624	635	638	652	655	671	675	679	688	691	694			
		697	701	710	713	716	720	730	733	736	740	752	766	780			
		794	799	808	812												
ICNT	001000	295#	298*	299	815*	816											
KM =	000000	224#	659	745													
KPTR =	000500	205#	300	342	660	669	683	689	692	705	711	724	731				
MEDIUM	000041	251#															
POP2 =	022626	215#	522	534													
PSW =	177776	210#	304*	313*	321*	346*	370*	374*	388*	402*	416*	430*	444*	458*			
		465*	468*	469*	470	479*	480*	481*	486*	487*	488*	489	495*	496*			
		497*	498	503*	504*	505*	506	512*	515*	516	526*	528*	529	538*			
		540*	541*	542	548*	555*	565*	574*	585*	595*	616*	630*	659*	661*			



