

PDP11/45

11/45 REGISTERS
CCKBHB0

AH-7813B-MC

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FICHE 1 OF 1

JUL 1978

digital

MADE IN USA

The microfiche card contains a series of frames on the left side, each containing different data and diagrams. The frames are arranged in a vertical column. The first frame at the top left contains a header with the text "PDP11/45" and "11/45 REGISTERS". Below this, there are several frames containing tables of data, some with headers like "REGISTER", "ADDRESS", and "DATA". Some frames contain diagrams, including a large one in the middle frame that appears to be a block diagram or a flowchart. The frames are separated by thin lines, and the overall layout is organized and systematic. The right side of the card is a large, dark blue area, which is likely a placeholder for additional information or a continuation of the data from the frames.

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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 PRECEEDING 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 CCKBH80 11/45 REGISTERS
.NLIST MC,MD
.LIST ME
.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

000001
000002
000004
000010
000020
000040
000100
000200

000400
001000
002000
004000
010000
020000
040000
100000

000000
000001
000002
000003
000004
000005
000006
000007
000006
000006
000006
000007

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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236
237      :      *****
238      :      MODIFIED FEB 28 1978
239
240      :      ++
241      :      ACT11 AND XXDP HOOKS
242      :      --
243
244      000400      $SVPC=.      ;SAVE PROGRAM COUNTER
245
246      000040      . =40
247 000040      000      DRIVE: .BYTE 0      ;DRIVE # FOR XXDP LOAD MEDIUM
248      ;ASSEMBLE AS A 0
249
250      000041      . =41
251 000041      000      MEDIUM: .BYTE 0      ;XXDP LOAD MEDIUM
252      ;ASSEMBLE AS A 0
253
254      000042      . =42
255 000042 000000      .WORD 0      ;ACT11 INDICATOR
256      ;ASSEMBLE AS A 0
257
258      000046      . =46
259 000046 004004      .WORD $ENDAD      ;SET TO $ENDAD IN .SEOP
260
261      000052      . =52
262 000052 000000      .WORD 0      ;CHARACTERISTICS OF PROGRAM
263      ;SET TO 0
264
265      000400      .=$SVPC      ;RESTORE PROGRAM COUNTER
266
267      :      *****
268
269      000100      . =100
270
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271
272      ; *****
273      ;
274      ;
275      ;
276      ;
277      ;
278      ;
279      ;
280 000100 000000      AUTOM: .WORD 0      ;AUTOMATIC MODE INDICATOR
281 000102      000      ACT11M: .BYTE 0      ;ACT11 AUTO MODE INDICATOR
282 000103      000      XXDPM: .BYTE 0      ;XXDP AUTO MODE INDICATOR
283 000104      000      ADUMPM: .BYTE 0      ;ACT11 DUMP MODE INDICATOR
284 000105      000      XDUMPM: .BYTE 0      ;XXDP DUMP MODE INDICATOR
285
286      ; *****
287
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288
289
290      000200      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      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      TO:      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			HLT	
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		AOA: 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	AOA
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
402 001462 012767 004000 176306 ;CHECK THAT ALL BITS IN R12 CAN BE SET/CLEARED.
403 001470 012767 000020 177306 A2:  MOV  #BIT11,PSW
404 001476 012702 000001          MOV  #20,TEMP+2
405 001502 010267 177274          MOV  #1,R12
406 001506 006367 177270          MOV  R12,TEMP
407 001512 006302          A2A:  ASL   TEMP
408 001514 020267 177262          ASL   R12
409 001520 001401          CMP   R12,TEMP
410 001522 000000          BEQ   .+4
411 001524 005367 177254          HLT
412 001530 001366          DEC   TEMP+2
413 001532 010701          BNE   A2A
414                               SCOPE
415
416 001534 012767 004000 176234 ;CHECK THAT ALL BITS IN R13 CAN BE SET/CLEARED.
417 001542 012767 000020 177234 A3:  MOV  #BIT11,PSW
418 001550 012703 000001          MOV  #20,TEMP+2
419 001554 010367 177222          MOV  #1,R13
420 001560 006367 177216          MOV  R13,TEMP
421 001564 006303          A3A:  ASL   TEMP
422 001566 020367 177210          ASL   R13
423 001572 001401          CMP   R13,TEMP
424 001574 000000          BEQ   .+4
425 001576 005367 177202          HLT
426 001602 001366          DEC   TEMP+2
427 001604 010701          BNE   A3A
428                               SCOPE
429
430 001606 012767 004000 176162 ;CHECK THAT ALL BITS IN R14 CAN BE SET/CLEARED.
431 001614 012767 000020 177162 A4:  MOV  #BIT11,PSW
432 001622 012704 000001          MOV  #20,TEMP+2
433 001626 010467 177150          MOV  #1,R14
434 001632 006367 177144          MOV  R14,TEMP
435 001636 006304          A4A:  ASL   TEMP
436 001640 020467 177136          ASL   R14
437 001644 001401          CMP   R14,TEMP
438 001646 000000          BEQ   .+4
439 001650 005367 177130          HLT
440 001654 001366          DEC   TEMP+2
441 001656 010701          BNE   A4A
442                               SCOPE
443
444 001660 012767 004000 176110 ;CHECK THAT ALL BITS IN R15 CAN BE SET/CLEARED.
445 001666 012767 000020 177110 A5:  MOV  #BIT11,PSW
446 001674 012705 000001          MOV  #20,TEMP+2
447 001700 010567 177076          MOV  #1,R15
448 001704 006367 177072          MOV  R15,TEMP
449 001710 006305          A5A:  ASL   TEMP
450 001712 020567 177064          ASL   R15
451 001716 001401          CMP   R15,TEMP
452 001720 000000          BEQ   .+4
453 001722 005367 177056          HLT
454 001726 001366          DEC   TEMP+2
455 001730 010701          BNE   A5A
                               SCOPE

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456
457
458 001732 012767 004000 176036 MOV #BIT11,PSW
459 001740 012700 000400 MOV #BIT8,R10
460 001744 012701 001000 MOV #BIT9,R11
461 001750 012702 002000 MOV #BIT10,R12
462 001754 012703 004000 MOV #BIT11,R13
463 001760 012704 010000 MOV #BIT12,R14
464 001764 012705 020000 MOV #BIT13,R15
465 001770 005067 176002 CLR PSW
466 001774 010701 SCOPE
467
468 001776 012767 004000 175772 T1: MOV #BIT11,PSW ;GO UPPER SET
469 002004 010067 175766 T1A: MOV R10,PSW ;MOVE BIT8 TO PSW (SWITCHES
470 002010 016767 175762 176764 MOV PSW,TEMP ;TO 11/20 REGS.)
471 002016 032767 000001 176756 BIT #BIT0,TEMP ;WAS CORRECT %0 LOADED IN PSW
472 002024 001401 BEQ .+4 ;IF BIT 0 WAS SET 11/20 REG 0
473 002026 000000 HLT ;WAS INCORRECTLY SELECTED
474 002030 005767 176746 TST TEMP ;IF TRULY R10 PSW WILL BE
475 002034 001401 BEQ .+4 ;CLEAR
476 002036 000000 HLT ;ERROR! DID INST AT T1A CLR PSW?
477 002040 010701 SCOPE
478
479 002042 012767 004000 175726 T2: MOV #BIT11,PSW
480 002050 010067 175722 MOV R10,PSW ;SEL 11/20 REGS.
481 002054 010067 175716 MOV R0,PSW ;MOVE BIT0 TO PSW (SETS C)
482 002060 103401 BCS .+4 ;IS CARRY SET?
483 002062 000000 HLT ;R0 NOT SELECTED
484 002064 010701 SCOPE
485
486 002066 012767 004000 175702 T3: MOV #BIT11,PSW
487 002074 040367 175676 BIC R13,PSW ;CLEAR BIT11 IN PSW
488 002100 010267 175672 MOV R2,PSW ;MOVE BIT1 TO PSW
489 002104 016767 175666 176670 MOV PSW,TEMP
490 002112 022767 000004 176662 CMP #BIT2,TEMP
491 002120 001401 BEQ .+4
492 002122 000000 HLT
493 002124 010701 SCOPE
494
495 002126 012767 004000 175642 T4: MOV #BIT11,PSW
496 002134 160367 175636 SUB R13,PSW
497 002140 074267 175632 XOR R2,PSW
498 002144 016767 175626 176630 MOV PSW,TEMP
499 002152 022767 000004 176622 CMP #BIT2,TEMP
500 002160 001401 BEQ .+4
501 002162 000000 HLT
502 002164 010701 SCOPE
503 002166 012767 004000 175602 T5: MOV #BIT11,PSW
504 002174 074367 175576 XOR R13,PSW
505 002200 074367 175572 XOR R3,PSW
506 002204 016767 175566 176570 MOV PSW,TEMP
507 002212 022767 000010 176562 CMP #BIT3,TEMP
508 002220 001401 BEQ .+4
509 002222 000000 HLT
510 002224 010701 SCOPE
511
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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
```

```
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          MOVB     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
617 002734 012703 001002          MOV      #TEMP,R13          ;SWITCH TO UPPER REG. SET
618 002740 012367 176040          MOV      (R13)+,TEMP+2      ;LOAD REGISTER
619 002744 022767 177777 176032          CMP      #-1,TEMP+2      ;MOVE TEMP TO TEMP+2
620 002752 001401                      BEQ      .+4          ;WAS TEMP MOVED
621 002754 000000                      HLT
622 002756 022703 001004          CMP      #TEMP+2,R13      ;ERROR!
623 002762 001401                      BEQ      .+4          ;DID R13 INCREMENT
```

```
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 SS?,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
```

```
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 001000          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                      ;SWITCH TO LOWER REG. SET
738 003476 022702 000004    CMP                      ;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
787 ;CHECK THAT ALL BITS IN THE MICRO BREAK REGISTER (177770) CAN BE SET
788 003642 012700 000001 ;AND CLEARED
789 003646 012702 177770 T33: MOV #1,R0
790 003652 010012 T33A: MOV #UBREAK,R2 ;GET ADDRESS OF MICRO BREAK REGISTER
791 003654 011203 MOV R0,(R2) ;LOAD TEST BIT INTO REGISTER
792 003656 020003 MOV (R2),R3 ;GET RESULT
793 003660 001401 CMP R0,R3 ;COMPARE RESULT & TEST BIT
794 003662 000000 BEQ .+4
795 HLT ;ERROR! TEST BIT (R0) DID NOT SET INTO
796 003664 040012 BIC R0,(R2) ;REGISTER
797 003666 011203 MOV (R2),R3 ;CLEAR TEST BIT IN REGISTER
798 003670 001401 BEQ .+4 ;GET RESULT
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      CLR      ACT11M      ;INIT ACT11 AUTO MODE INDICATOR
842 004030 105067 174047      CLR      XXDPM      ;INIT XXDP AUTO MODE INDICATOR
843 004034 105067 174044      CLR      ADUMPM      ;INIT ACT11 DUMP MODE INDICATOR
844 004040 105067 174041      CLR      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      CLR      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*													
AO	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*			

[illegible]

CCKBHBO 11/45 REGISTERS
CCKBHB.P11 21-APR-78 09:34

MACY11 30A(1052) 01-MAY-78 13:27 PAGE 22
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0021

T6	002226	512#												
T6A	002276	513	521#											
T6X	002302	518	520	523#										
T7	002304	525#												
T7A	002344	525	533#											
T7X	002350	530	532	535#										
UBREAK=	177770	211#	303*	789	805*	806	810							
UM	= 140000	226#	663	773										
UPTR	= 000700	207#	664	677										
XDUMPM	000105	284#	844*	858*										
XXDPM	000103	282#	842*	850*										
SENDAD	004004	259	825#											
SSVPC	= 000400	244#	265											
.	= 004136	233#	235	244	246#	250#	254#	258#	261#	265#	269#	290#	294#	297#
		302	325	328	331	334	337	340	343	348	351	354	357	360
		363	381	395	409	423	437	451	472	475	482	491	500	508
		544	551	560	569	579	589	608	620	623	634	637	651	654
		670	674	678	690	693	696	700	712	715	719	732	735	739
		751	765	779	793	798	807	811	821					

. ABS. 004136 000

ERRORS DETECTED: 0

CCKBHB,DSKW:CCKBHB.SEQ/SOL/NL:TOC=CCKBHB.P11

RUN-TIME: .9 1 .2 SECONDS

RUN-TIME RATIO: 79/3=25.1

CORE USED: 6K (11 PAGES)

DOCUMENT PAGES: 21