

PDP11/05

TEST 14 TRAPS TEST
CZKARB0

AH-8819B-MC

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IDENTIFICATION

PRODUCT CODE: AC-8818B-MC
PRODUCT NAME: CZKARBO TST 14 TRAPS TST
PRODUCT DATE: 30-SEP-78
MAINTAINER: DIAGNOSTIC ENGINEERING

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1. ABSTRACT

THIS IS A TEST OF ALL OPERATION AND INSTRUCTION THAT CAUSE TRAPS. ALSO TESTED ARE TRAP OVERFLOW CONDITIONS, ODDITIES OF REGISTER 6, INTERRUPTS AND THE RESET INSTRUCTIONS.

THIS PROGRAM HAS BEEN RENAMED FROM LINAR TO CZKAR.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11/20, 11/05 STANDARD COMPUTER

2.2 STORAGE

2.2.1 PROGRAM STORAGE - THE ROUTINE USES MEMORY FROM 0000 TO 17500.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED:

4.1 CONTROL SWITCH SETTING

THE PROGRAM STARTS AND RESTARTS AT 200 FOR A 4K SYSTEM

4.2 STARTING ADDRESS OR ADDRESSES

(A) 200 = STARTING ADDRESS FOR 4K
202 = STARTING ADDRESS FOR 8K
204 = STARTING ADDRESS FOR 12K

206 = STARTING ADDRESS FOR 16K
210 = STARTING ADDRESS FOR 20K
212 = STARTING ADDRESS FOR 24K
214 = STARTING ADDRESS FOR 28K

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4.3 PROGRAM AND/OR OPERATOR ACTION

LOAD PROGRAM INTO MEMORY. (BOTTOM 4K)
SET SWITCH REGISTER TO STARTING ADDRESS,
LOAD ADDRESS,
PRESS START,
THE PROGRAM WILL LOOP,
AND RING A BELL AFTER EACH ITERATIONS

5. OPERATION PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

NO SWITCHES ARE USED

5.2 SUBROUTINE ABSTRACTS

5.2.1 BEGIN SA 200

5.2.2 SCOPE

IS A 'MOV %7,%0' THAT IS PLACED BETWEEN EACH SUBTEST
IN THE INSTRUCTION SECTION. IF A SCOPE LOOP IS
NEEDED. INSERT A BRANCH TO THE PREVIOUS SCOPE
LOCATION AT THE CURRENT SCOPE LOCATION.

5.2.3 HLT

INDICATES THE UNIQUE ADDRESS THAT TAGS THE FAILING
SUBTEST. THE INCORRECT DATA AT THE TIME OF THE
FAILURE MAY OR MAY NOT BE DISPLAYED IN REGISTER
ZERO, WHICH IS THE DATA REGISTER ON A HALT.

5.2.4 TRAPCATCHER

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THIS IS A SERIES OF INSTRUCTIONS DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS AND INTERRUPTS, THAT OCCUR IN THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

THE PRINCIPAL OF THIS ROUTINE IS: THE VECTOR ENTRANCE ADDRESS POINTS TO THE NEXT SEQUENTIAL WORD WHICH WILL CONTAIN A HALT (000000) (THIS LOCATION IS ALSO THE STATUS WORD FOR THAT VECTOR ENTRANCE. BUT THIS WILL HAVE NO EFFECT ON IT ALSO BEING THE NEXT INSTRUCTION).

IF A HALT OCCURS IN THE TRAP OR INTERRUPT VECTOR AREA, REGISTER SIX SHOULD BE EXAMINED TO DETERMINE ITS CONTENTS, THEN USE REGISTER SIX CONTENTS AS AN ADDRESS TO DETERMINE THE LOCATION THE PROGRAM WAS AT. WHEN THE INTERRUPT OR TRAP OCCURRED. (MEMORY AS SPECIFIED BY R6 CONTAINS THE PC OF THE INSTRUCTION FOLLOWING THE INSTRUCTION WHERE THE TRAP OCCURRED).

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 LOADING AND STARTING AT 200 STARTS THE TEST IF AN ERROR IS DETECTED. THERE WILL BE A HALT. WHEN A HALT OCCURS AND IT IS NECESSARY TO SCOPE ON IT, PLACE INSERT A BRANCH INSTRUCTION IN THE SCOPE LOCATION FOLLOWING THE HALT. THE BRANCH INSTRUCTION SHOULD BRANCH YOU TO THE PREVIOUS SCOPE LOCATION.

6. ERRORS

6.1 ALL ERRORS WILL CAUSE A HALT.

6.2 ERROR RECOVERY

ON TRAP ERRORS - RESTART AT STARTING ADDRESS DEPRESS CONTINUE TO CONTINUE TEST

7. RESTRICTIONS

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7.1 STARTING RESTRICTION

NONE

7.2 OPERATIONAL RESTRICTION

NONE

8. MISCELLANEOUS

8.1 EXECUTION TIME

FOR THE TEST ABOUT 45 SECONDS

9. PROGRAM DESCRIPTION

THIS PROGRAM CHECKS THAT ON ALL TRAP OPERATIONS REGISTER 6 IS DECREMENTED THE CORRECT AMOUNT, THAT THE CORRECT PC IS SAVED ON THE STACK, THAT THE OLD CONDITION CODES AND PRIORITY ARE PLACED ON THE STACK AND THAT THE NEW STATUS AND CONDITION CODES ARE CORRECT. BOTH THE 'TRAP' AND 'EMT' TRAP INSTRUCTIONS ARE TESTED THAT ALL COMBINATION WILL TRAP. CHECKED ALSO IS THAT ALL RESTRICTED INSTRUCTIONS WILL TRAP. VERIFICATION OF THE 'TRT' INSTRUCTION (00003) WHICH IS USED FOR SOFTWARE DEBUG ROUTINES: ODT,DDT. ALSO, THERE IS INCLUDED OF A SPECIAL REGISTER TEST TO SEE IF ANY AUTO DECREMENT OF REGISTER WILL CAUSE A TRAP OVERFLOW WHEN REGISTER 6 IS LESS THAN 400. TRAP OVERFLOW SHOULD ALSO OCCUR WITH TRAPS AND INTERRUPTS WHEN REGISTER 6 IS LESS THAN 400. SPECIAL CHECKS ARE MADE TO SEE IF BUS ERROR TRAPS OCCUR ON ODD ADDRESS WITH WORD INSTRUCTION AND NON EXISTENT MEMORY.

10. LISTING

11. FLOW CHART(S)

.FNDR

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259      :TEST 14
260      :COPYRIGHT 1970, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
261      :PDP-11 TRAP INSTRUCTION TEST AND ODD ON UNIQUE R6 OPERATIONS
262      :ALL INSTRUCTIONS THAT ARE RESERVED
263      :SHOULD TRAP TO LOCATION 10, AND THE
264      :PC THAT POINTS TO THE TRAPPING INSTRUCTION
265      :SHOULD BE PLACED ON THE STACK
266      .ENABLE ABS
267      .TITLE CZKARBO TST 14 TRAPS TST
268      LP=%6
269      TAB=%0
270      LAST=%1
271      FIRST=%2
272      SCOPE=010700      ;MOV REGISTER 7 TO REGISTER ZERO TO TAG LAST TEST
273      HLT=HALT
274      TRT=3
275      ITRAP5=4
276      RTRAP5=4      ;RESERVED INST AND ILLEGAL ADDRESSES
277      RTRAP4=14      ;FOR TRACE TRAP
278      RTRAP3=30      ;FOR EMULATOR TRAP
279      RTRAP2=20      ;FOR IOT TRAP
280      RTRAP1=34      ;FOR TRAP INST
281      ITBUF=177566
282      ITCSR=177564
283      TRCSR=177560
284      BELL=240
285      NOP=240
286      STATUS=177776
287      TRAPA=70000
288      RTRAP=10
289      ILLA=004700
290      ILLB=100
291      CC=177776
292      .=0
293      .REPT 40
294      .+2
295      HALT      ;TRAPPED TO PREVIOUS ADDRESS
296      .ENDR
297
298      .46
299      $ENDAD
300
301      .=52
302      40000
303
304
305      .-200
306
307      000200 000410      BR      ST4K      :14K
308      000202 000425      BR      ST8K      :18K
309      000204 000431      BR      ST12K     :12K
310      000206 000435      BR      ST16K     :16K
311      000210 000441      BR      ST20K     :20K
312      000212 000445      BR      ST24K     :24K
313      000214 000451      BR      ST28K     :28K
314      000216 000167 004224      JMP     TONT      ;ERROR ON ERROR

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315 000222 005767 177614          ST4K:  TST      42          ;WITH ACT11 OR DDP1
316 000226 001406                   BEQ      .+16
317 000230 012767 000240 006056   MOV      #NOP,AUTO
318 000236 012767 000240 006060   MOV      #NOP,AUTO1
319 000244 012767 020000 006012   MOV      #20000,CORH
320 000252 000167 000122           JMP      BEGIN
321 000256 012767 040000 006000   ST8K:  MOV      #40000,CORH
322 000264 000167 000110           JMP      BEGIN
323 000270 012767 060000 005766   ST12K: MOV      #60000,CORH
324 000276 000167 000076           JMP      BEGIN
325 000302 012767 100000 005754   ST16K: MOV      #100000,CORH
326 000310 000167 000064           JMP      BEGIN
327 000314 012767 120000 005742   ST20K: MOV      #120000,CORH
328 000322 000167 000052           JMP      BEGIN
329 000326 012767 140000 005730   ST24K: MOV      #140000,CORH
330 000334 000167 000040           JMP      BEGIN
331 000340 012767 160000 005716   ST28K: MOV      #160000,CORH
332 000346 000167 000026           JMP      BEGIN
333                000400                .-400
334
335                ; EST THAT A TRAP OCCURS ON ALL RESTRICTED INSTRUCTION
336 000400 010700                   BEGIN:  SCOPE
337 000402 012706 010340           MOV      #BUFF,LP          ;LINK POINTER SETUP
338 000406 012767 000420 177374   MOV      #RETA,RTRAP      ;RETURN LOCATION
339 000414 070000                   TRAPA                   ;RESERVED INSTRUCTION, SHOULD TRAP
340 000416 000000                   HLT
341 000420 010700                   RETA:  SCOPE
342
343                ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
344 000422 012706 010340           MOV      #BUFF,LP          ;LINK POINTER SETUP
345 000426 012767 000436 177354   MOV      #RETB,RTRAP      ;RETURN POINTER
346 000434 070000                   TRAPA                   ;RESERVED INSTRUCTION
347 000436 020627 010334           RETB:  CMP      LP,#BU F-4  ;TEST DECREMENT OF LP
348 000442 001401                   BEQ      .+4
349 000444 000000                   HLT
350 000446 010700                   SCOPE                   ;NOT DECREMENTED TWO WORDS
351
352                ;TEST THAT PROPER P.C. IS SAVED
353 000450 012706 010340           MOV      #BUFF,LP          ;LINK POINTER SETUP
354 000454 012767 000464 177326   MOV      #RETC,RTRAP      ;RETURN FROM TRAP POINTER
355 000462 070000                   INSTC: TRAPA            ;TRAP ON THIS INSTRUCTION
356 000464 022767 000464 007642   RETC:  CMP      #.,BUFF-4  ;CHECK FOR INCREMENTED P.C.
357 000472 001401                   BEQ      .+4
358 000474 000000                   HLT
359 000476 010700                   SCOPE                   ;INCORRECT P.C.
360
361                ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
362 000500 010700                   SCOPE
363 000502 012706 010340           MOV      #BUFF,LP          ;SET UP
364 000506 012767 000524 177274   MOV      #RETD,RTRAP      ;SET UP
365 000514 005067 177256           CLR      CC                ;CLEAR CC AND PRIORITY
366 000520 000257                   CCC
367 000522 070000                   TRAPA                   ;TRAP
368 000524 026727 007606 000000   RETD:  CMP      BU F-2,#0  ;TEST THAT OLD STATUS WENT TO STACK
369 000532 001401                   BEQ      .                ;TEST FOR ALL ZEROS
370 000534 000000                   HLT                       ;INCORRECT STATUS

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371 000536 010700          SCOPE
372 000540 012706 010340  MOV      #BUFF,LP      ;SET UP
373 000544 012767 000564 177236  MOV      #RETE,RTRAP   ;SET UP
374 000552 012767 000357 177216  MOV      #357,CC       ;SET PRIORITY
375 000560 000277          SCC          ;SET CC
376 000562 070000          TRAPA       ;TRAP
377 000564 026727 007546 000357  RETE:    CMP      BUFF-2,#357  ;COMPARES STATUS ON STACK
378 000572 001401          BEQ      .+4          ;TEST FOR ALL ONES
379 000574 000000          HLT          ;INCORRECT STATUS ON STACK
380 000576 010700          SCOPE
381
382          ;TEST THAT 'NEW' STATUS IS CORRECT
383 000600 012706 010340  MOV      #BUFF,LP
384 000604 012767 000620 177176  MOV      #RETF,RTRAP
385 000612 005067 177174  CLR      RTRAP+2      ;CLEAR FUTURE PRIORITY AND CC
386 000616 070000          TRAPA
387 000620 100001          RETF:    BPL      .+4      ;TEST FOR 'C' CLEARED
388 000622 000000          HLT          ;C NOT CLEARED
389 000624 001001          BNF      .+4
390 000626 000000          HLT          ;Z NOT CLEARED
391 000630 102001          BVC      .+4
392 000632 000000          HLT          ;V NOT CLEARED
393 000634 103001          BCC      .+4
394 000636 000000          HLT          ;C NOT CLEARED
395 000640 032767 000340 177130  BIT      #340,CC      ;TEST PRIORITY
396 000646 001401          BEQ      .+4
397 000650 000000          HLT          ;PRIORITY NOT ZERO
398 000652 010700          SCOPE
399 000654 012706 010340  MOV      #BUFF,LP
400 000660 012767 000676 177122  MOV      #RETG,RTRAP
401 000666 012767 000357 177116  MOV      #357,RTRAP+2 ;SET NEW 'CC' AND PRIORITY
402 000674 070000          TRAPA       ;TRAP HERE
403 000676 100401          RETG:    BMI      .+4
404 000700 000000          HLT          ;N NOT SET
405 000702 001401          BEQ      .+4
406 000704 000000          HLT          ;Z NOT SET
407 000706 102401          BVS      .+4
408 000710 000000          HLT          ;V NOT SET
409 000712 103401          BCS      .+4
410 000714 000000          HLT          ;C NOT SET
411 000716 016706 177054  MOV      CC,LP
412 000722 042706 000017  BIC      #17,LP
413 000726 022706 000340  CMP      #340,LP
414 000732 001401          BEQ      .+4
415 000734 000000          HLT          ;PRIORITY WAS CHANGED
416 000736 010700          SCOPE
417 000740 012767 000012 177042  MOV      #12,10
418 000746 005067 177040  CLR      12
419
420          ;TEST THAT A TRAP OCCURS FOR A 'TRAP' INSTRUCTION
421 000752 010700          SCOPE
422 000754 012706 010340  MOV      #BUFF,LP      ;LINK POINTER SETUP
423 000760 012767 000772 177046  MOV      #RETA1,RTRAP1 ;RETURN LOCATION
424 000766 104400          TRAP       ;RESERVED INSTRUCTION, SHOULD TRAP
425 000770 000000          HLT
426 000772 010700          RETA1:    SCOPE

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427
428 ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
429 000774 012706 010340 MOV #BUFF,LP ;LINK POINTER SETUP
430 001000 012767 001010 177026 MOV #RETB1,RTRAP1 ;RETURN POINTER
431 001006 104400 TRAP ;RESERVED INSTRUCTION
432 001010 020627 010334 RETB1: CMP LP,#BUFF-4 ;TEST DECREMENT OF LP
433 001014 001401 BEQ .+4
434 001016 000000 HLT ;NOT DECREMENTED TWO WORDS
435 001020 010700 SCOPE
436
437 ;TEST THAT PROPER P.C. IS SAVED
438 001022 012706 010340 MOV #BUFF,LP ;LINK POINTER SETUP
439 001026 012767 001036 177000 MOV #RETC1,RTRAP1 ;RETURN FROM TRAP POINTER
440 001034 104400 TRAP ;TRAP ON THIS INSTRUCTION
441 001036 022767 001036 007270 RETC1: CMP #,BUFF-4 ;CHECK INCREMENTED P.C.
442 001044 001401 BEQ .+4
443 001046 000000 HLT ;INCORRECT P.C.
444 001050 010700 SCOPE
445
446 ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
447 001052 010700 SCOPE
448 001054 012706 010340 MOV #BUFF,LP ;SET UP
449 001060 012767 001076 176746 MOV #RETD1,RTRAP1 ;SET UP
450 001066 005067 176704 CLR CC ;CLEAR CC AND PRIORITY
451 001072 000257 CCC
452 001074 104400 TRAP ;TRAP
453 001076 026727 007234 000000 RETD1: CMP BUFF-2,#0 ;TEST THAT OLD STATUS WENT TO STACK
454 001104 001401 BEQ .+4 ;TEST FOR ALL ZEROS
455 001106 000000 HLT ;INCORRECT STATUS
456 001110 010700 SCOPE
457 001112 012706 010340 MOV #BUFF,LP ;SET UP
458 001116 012767 001134 176710 MOV #RETE1,RTRAP1 ;SET UP
459 001124 012767 000357 176644 MOV #357,CC ;SET PRIORITY
460 001132 104400 TRAP ;SET CC
461 001134 026727 007176 000357 RETE1: CMP BUFF-2,#357 ;COMPARES STATUS ON STACK
462 001142 001401 BEQ .+4 ;TEST FOR ALL ONES
463 001144 000000 HLT ;INCORRECT STATUS ON STACK
464
465 ;TEST THAT 'NEW' STATUS IS CORRECT
466 001146 012706 010340 MOV #BUFF,LP
467 001152 012767 001166 176654 MOV #RETF1,RTRAP1
468 001160 005067 176652 CLR RTRAP1+2 ;CLEAR FUTURE PRIORITY AND CC
469 001164 104400 TRAP
470 001166 100001 RETF1: BPL .+4 ;TEST FOR 'C' CLEARED
471 001170 000000 HLT ;C NOT CLEARED
472 001172 001001 BNE .+4
473 001174 000000 HLT ;Z NOT CLEARED
474 001176 102001 BVC .+4
475 001200 000000 HLT ;V NOT CLEARED
476 001202 103001 BCC .+4
477 001204 000000 HLT ;C NOT CLEARED
478 001206 032767 000340 176562 BIT #340,CC ;TEST PRIORITY
479 001214 001401 BEQ .+4
480 001216 000000 HLT ;PRIORITY NOT ZERO
481 001220 010700 SCOPE
482 001222 012706 010340 MOV #BUFF,LP

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483 001226 012767 001244 176600      MOV      #RETG1,RTRAP1
484 001234 012767 000357 176574      MOV      #357,RTRAP1+2      ;SET NEW 'CC' AND PRIORITY
485 001242 104400                      TRAP                      ;TRAP HERE
486 001244 100401                      RETG1: BMI      .+4
487 001246 000000                      HLT                                ;N NOT SET
488 001250 001401                      BEQ      .+4
489 001252 000000                      HLT                                ;Z NOT SET
490 001254 102401                      BVS      .+4
491 001256 000000                      HLT                                ;V NOT SET
492 001260 103401                      BCS      .+4
493 001262 000000                      HLT                                ;C NOT SET
494 001264 016706 176506      MOV      CC,LP
495 001270 042706 000017      BIC      #17,LP
496 001274 022706 000340      CMP      #340,LP
497 001300 001401                      BEQ      .+4
498 001302 000000                      HLT                                ;PRIORITY WAS CHANGED
499 001304 010700                      SCOPE
500
501                      ;TEST THAT ALL COMBINATION OF 'TRAP' WILL CAUSE A TRAP
502 001306 012767 104400 000012      MOV      #TRAP,RB1          ;INITIALIZE BASE TRAP INSTRUCTION
503 001314 012767 001332 176512      MOV      #RA1,34          ;RETURN FROM TRAP TO RA1
504 001322 012706 010340      RC1:    MOV      #BUFF,LP    ;SET UP STACK POINTER
505 001326 104400      RB1:    TRAP                      ;TRAP INST WILL BE MODIFIED TO TRAP +377
506 001330 000000                      HLT                                ;PREVIOUS INST FAILED TO TRAP
507 001332 005267 177770      RA1:    INC      RB1          ;INCREMENT TRAP INSTRUCTION
508 001336 022767 104777 177762      CMP      #104777,RB1      ;TRAP+377 TO UPPER LIMIT
509 001344 103366                      BHIS     RC1                ;HAVE WE TESTED ALL
510 001346 010700                      SCOPE                        ;YES
511 001350 012767 000036 176456      MOV      #36,34
512 001356 005067 176454      CLR      36
513
514                      ;TEST THAT A TRAP OCCURS ON AN 'IOT' INSTRUCTION
515 001362 010700                      SCOPE
516 001364 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
517 001370 012767 001402 176422      MOV      #RETA2,RTRAP2    ;RETURN LOCATION
518 001376 000004                      IOT                          ;RESERVED INSTRUCTION, SHOULD TRAP
519 001400 000000                      HLT
520 001402 010700      RETA2: SCOPE
521
522                      ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
523 001404 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
524 001410 012767 001420 176402      MOV      #RETB2,RTRAP2    ;RETURN POINTER
525 001416 000004                      IOT                          ;RESERVED INSTRUCTION
526 001420 020627 010334      RETB2: CMP      LP,#BUFF-4  ;TEST DECREMENT OF LP
527 001424 001401                      BEQ      .+4
528 001426 000000                      HLT                                ;NGT DECREMENTED TWO WORDS
529 001430 010700                      SCOPE
530
531                      ;TEST THAT PROPER P.C. IS SAVED
532 001432 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
533 001436 012767 001446 176354      MOV      #RETC2,RTRAP2    ;RETURN FROM TRAP POINTER
534 001444 000004                      IOT                          ;TRAP ON THIS INSTRUCTION
535 001446 022767 001446 006660      RETC2: CMP      #.,BUFF-4  ;CHECK FOR INCREMENTED P.C.
536 001454 001401                      BEQ      .+4
537 001456 000000                      HLT                                ;INCORRECT P.C.
538 001460 010700                      SCOPE

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539
540 ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
541 001462 010700 SCOPE
542 001464 012706 010340 MOV #BUFF,LP ;SET UP
543 001470 012767 001506 176322 MOV #RETD2,RTRAP2 ;SET UP
544 001476 005067 176274 CLR CC ;CLEAR CC AND PRIORITY
545 001502 000257 CCC
546 001504 000004 IOT ;TRAP
547 001506 026727 006624 000000 RETD2: CMP BUFF-2,#0 ;TEST THAT OLD STATUS WENT TO STACK
548 001514 001401 BEQ .+4 ;TEST FOR ALL ZEROS
549 001516 000000 HLT ;INCORRECT STATUS
550 001520 010700 SCOPE
551 001522 012706 010340 MOV #BUFF,LP ;SET UP
552 001526 012767 001546 176264 MOV #RETE2,RTRAP2 ;SET UP
553 001534 012767 000357 176234 MOV #357,CC ;SET PRIORITY
554 001542 000277 SCC ;SET CC
555 001544 000004 IOT ;TRAP
556 001546 026727 006564 000357 RETE2: CMP BUFF-2,#357 ;COMPARES STATUS ON STACK
557 001554 001401 BEQ .+4 ;TEST FOR ALL ONES
558 001556 000000 HLT ;INCORRECT STATUS ON STACK
559 001560 010700 SCOPE
560
561 ;TEST THAT 'NEW' STATUS IS CORRECT
562 001562 012706 010340 MOV #BUFF,LP
563 001566 012767 001602 176224 MOV #RETF2,RTRAP2
564 001574 005067 176222 CLR RTRAP2+2 ;CLEAR FUTURE PRIORITY AND CC
565 001600 000004 IOT
566 001602 100001 RETF2: BPL .+4 ;TEST FOR 'C' CLEARED
567 001604 000000 HLT ;C NOT CLEARED
568 001606 001001 BNE .+4 ;
569 001610 000000 HLT ;Z NOT CLEARED
570 001612 102001 BVC .+4 ;Z NOT CLEARED
571 001614 000000 HLT ;V NOT CLEARED
572 001616 103001 BCC .+4
573 001620 000000 HLT ;C NOT CLEARED
574 001622 032767 000340 176146 BIT #340,CC ;TEST PRIORITY
575 001630 001401 BEQ .+4
576 001632 000000 HLT ;PRIORITY NOT ZERO
577 001634 010700 SCOPE
578 001636 012706 010340 MOV #BUFF,LP
579 001642 012767 001660 176150 MOV #RETG2,RTRAP2
580 001650 012767 000357 176144 MOV #357,RTRAP2+2 ;SET NEW 'CC' AND PRIORITY
581 001656 000004 IOT ;TRAP HERE
582 001660 100401 RETG2: BMI .+4
583 001662 000000 HLT ;N NOT SET
584 001664 001401 BEQ .+4
585 001666 000000 HLT ;Z NOT SET
586 001670 102401 BVS .+4
587 001672 000000 HLT ;V NOT SET
588 001674 103401 BCS .+4
589 001676 000000 HLT ;C NOT SET
590 001700 016706 176072 MOV CC,LP
591 001704 042706 000017 BIC #17,LP
592 001710 022706 000340 CMP #340,LP
593 001714 001401 BEQ .
594 001716 000000 HLT ;PRIORITY WAS CHANGED

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595 001720 010700          SCOPE
596 001722 012767 000022 176070      MOV    #22,20      ;.+2
597 001730 005067 176066          CLR    22          ;HALT
598
599          ;TEST THAT A TRAP OCCURS ON AN EMT RESTRICTED INSTRUCTION
600 001734 010700          SCOPE
601 001736 012706 010340      MOV    #BUFF,LP    ;LINK POINTER SETUP
602 001742 012767 001754 176060      MOV    #RETA3,RTRAP3 ;RETURN LOCATION
603 001750 104000          EMT                    ;RESERVED INSTRUCTION, SHOULD TRAP
604 001752 000000          HLT
605 001754 010700      RETA3: SCOPE
606
607          ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
608 001756 012706 010340      MOV    #BUFF,LP    ;LINK POINTER SETUP
609 001762 012767 001772 176040      MOV    #RETB3,RTRAP3 ;RETURN POINTER
610 001770 104000          EMT                    ;RESERVED INSTRUCTION
611 001772 020627 010334      RETB3: CMP    .P,#BUFF-4 ;TEST DECREMENT OF LP
612 001776 001401          BEQ    .+4
613 002000 000000          HLT                    ;NOT DECREMENTED TWO WORDS
614          ;TEST THAT PROPER P.C IS SAVED
615 002002 012706 010340      MOV    #BUFF,LP    ;LINK POINTER SETUP
616 002006 012767 002016 176014      MOV    #RETC3,RTRAP3 ;RETURN FROM TRAP POINTER
617 002014 104000          EMT                    ;TRAP ON THIS INSTRUCTION
618 002016 022767 002016 006310      RETC3: CMP    #.,BUFF-4 ;CHECK FOR INCREMENTED P.C.
619 002024 001401          BEQ    .+4
620 002026 000000          HLT                    ;INCORRECT P.C.
621 002030 010700          SCOPE
622
623          ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
624 002032 010700          SCOPE
625 002034 012706 010340      MOV    #BUFF,LP    ;SET UP
626 002040 012767 002056 175762      MOV    #RETD3,RTRAP3 ;SET UP
627 002046 005067 175724          CLR    CC          ;CLEAR CC AND PRIORITY
628 002052 000257          CCC
629 002054 104000          EMT                    ;TRAP
630 002056 026727 006254 000000      RETD3: CMP    BUFF-2,#0 ;TEST THAT OLD STATUS WENT TO STACK
631 002064 001401          BEQ    .+4          ;TEST FOR ALL ZEROS
632 002066 000000          HLT                    ;INCORRECT STATUS
633 002070 010700          SCOPE                ;INCORRECT STATUS
634 002072 012706 010340      MOV    #BUFF,LP    ;SET UP
635 002076 012767 002116 175724      MOV    #RETE3,RTRAP3 ;SET UP
636 002104 012767 000357 175664      MOV    #357,CC     ;SET PRIORITY
637 002112 000277          SCC                    ;SET CC
638 002114 104000          EMT                    ;TRAP
639 002116 026727 006214 000357      RETE3: CMP    BUFF-2,#357 ;COMPARES STATUS ON STACK
640 002124 001401          BEQ    .+4          ;TEST FOR ALL ONES
641 002126 000000          HLT                    ;INCORRECT STATUS ON STACK
642 002130 010700          SCOPE
643
644          ;TEST THAT 'NEW' STATUS IS CORRECT
645 002132 012706 010340      MOV    #BUFF,LP    ;SET UP
646 002136 012767 002152 175664      MOV    #RETF3,RTRAP3 ;SET UP
647 002144 005067 175662          CLR    RTRAP3+2    ;CLEAR FUTURE PRIORITY AND CC
648 002150 104000          EMT                    ;TEST FOR 'C' CLEARED
649 002152 100001          RETF3: BPL    .+1    ;C NOT CLEARED
650 002154 000000          HLT
    
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651 002156 001001      BNE      .+4
652 002160 000000      HLT              ;Z NOT CLEARED
653 002162 102001      BVC      .+4
654 002164 000000      HLT              ;V NOT CLEARED
655 002166 103001      BCC      .+4
656 002170 000000      HLT              ;C NOT CLEARED
657 002172 032767 000340 175576      BIT      #340,CC  ;TEST PRIORITY
658 002200 001401      BEQ      .+4
659 002202 000000      HLT              ;PRIORITY NOT ZERO
660 002204 010700      SCOPE
661 002206 012706 010340      MOV      #BUFF,LP
662 002212 012767 002230 175610      MOV      #RETG3,RTRAP3
663 002220 012767 000357 175604      MOV      #357,RTRAP3+2 ;SET NEW 'CC' AND PRIORITY
664
665 002226 104000      EMT              ;TRAP HERE
666 002230 100401      RETG3: BMI      .+4
667 002232 000000      HLT              ;N NOT SET
668 002234 001401      BEQ      .+4
669 002236 000000      HLT              ;Z NOT SET
670 002240 102401      BVS      .+4
671 002242 000000      HLT              ;V NOT SET
672 002244 103401      BCS      .+4
673 002246 000000      HLT              ;C NOT SET
674 002250 016706 175522      MOV      CC,LP
675 002254 042706 000017      BIC      #17,LP
676 002260 022706 000340      CMP      #340,LP
677 002264 001401      BEQ      .+4
678 002266 000000      HLT              ;PRIORITY WAS CHANGED
679 002270 010700      SCOPE
680
681      ;TEST THAT ALL COMBINATION OF EMT WILL CAUSE A TRAP
682 002272 010700      SCOPE
683 002274 012767 104000 000012      MOV      #EMT,RB      ;INITIALIZE BASE EMT INSTRUCTION
684 002302 012767 002320 175520      MOV      #RA,30      ;RETURN FROM TRAP TO RA
685 002310 012706 010340      RC: MOV      #BUFF,LP ;SET UP STACK POINTER
686 002314 104000      RB: EMT              ;TRAP INST. WILL BE MODIFIED TO EMT+377
687 002316 000000      HLT              ;PRVIOUS INST FAILED TO TRAP
688 002320 005267 177770      RA: INC      RB      ;INCREMENT TRAP INSTRUCTION
689 002324 022767 104377 177762      CMP      #104377,RB ;EMT+377 TO EMT?
690 002332 103366      BHIS     RC          ;HAVE WE TESTED ALL
691 002334 010700      SCOPE           ;YES
692 002336 012767 000032 175464      MOV      #32,30      ;/.+
693 002344 005067 175462      CLR      32         ;HALT
694
695      ;TEST THAT A TRAP OCCURS ON AN 'TRACE-TRT' INSTRUCTION
696 002350 010700      SCOPE
697 002352 012706 010340      MOV      #BUFF,LP      ;LINK POINTER SETUP
698 002356 012767 002370 175430      MOV      #RETA4,RTRAP4 ;RETURN LOCATION
699 002364 000003      TRT              ;RESERVED INSTRUCTION, SHOULD TRAP
700 002366 000000      HLT
701 002370 010700      RETA4: SCOPE
702
703      ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
704 002372 012706 010340      MOV      #BUFF,LP      ;LINK POINTER SETUP
705 002376 012767 002406 175410      MOV      #RETB4,RTRAP4 ;RETURN POINTER
706 002404 000003      TRT              ;RESERVED INSTRUCTION
    
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707 002406 020627 010334      RETB4:  CMP      LP,#BUFF-4      ;TEST DECREMENT OF LP
708 002412 001401              BEQ      .+4
709 002414 000000              HLT
710 002416 010700              SCOPE      ;NOT DECREMENTED TWO WORDS
711
712              ;TEST THAT PROPER P.C. IS SAVED
713 002420 012706 010340      MOV      #BUFF,LP      ;LINK POINTER SETUP
714 002424 012767 002434 175362  MOV      #RETC4,RTRAP4 ;RETURN FROM TRAP POINTER
715 002432 000003              TRT      ;TRAP ON THIS INSTRUCTION
716 002434 022767 002434 005672  RETC4:  CMP      #.,BUFF-4      ;CHECK FOR INCREMENTED P.C.
717 002442 001401              BEQ      .+4
718 002444 000000              HLT      ;INCORRECT P.C.
719 002446 010700              SCOPE
720
721              ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
722 002450 010700              SCOPE
723 002452 012706 010340      MOV      #BUFF,LP      ;SET UP
724 002456 012767 002474 175330  MOV      #RETD4,RTRAP4 ;SET UP
725 002464 005067 175306      CLR      CC      ;CLEAR CC AND PRIORITY
726 002470 000257              CCC
727 002472 000003              TRT      ;TRAP
728 002474 026727 005636 000000  RETD4:  CMP      BUFF-2,#0      ;TEST THAT OLD STATUS WENT TO STACK
729 002502 001401              BEQ      .+4      ;TEST FOR ALL ZEROS
730 002504 000000              HLT      ;INCORRECT STATUS
731 002506 010700              SCOPE
732 002510 012706 010340      MOV      #BUFF,LP      ;SET UP
733 002514 012767 002534 175272  MOV      #RETE4,RTRAP4 ;SET UP
734 002522 012767 000357 175246  MOV      #357,CC      ;SET PRIORITY
735 002530 000277              SCC      ;SET-SET CC
736 002532 000003              TRT      ;TRAP
737 002534 026727 005576 000357  RETE4:  CMP      BUFF-2,#357      ;COMPARES STATUS ON STACK
738 002542 001401              BEQ      .+4      ;TEST FOR ALL ONES
739 002544 000000              HLT      ;INCORRECT STATUS ON STACK
740 002546 010700              SCOPE
741
742              ;TEST THAT 'NEW' STATUS IS CORRECT
743 002550 012706 010340      MOV      #BUFF,LP
744 002554 012767 002570 175232  MOV      #RETF4,RTRAP4
745 002562 005067 175230      CLR      RTRAP4+2      ;CLEAR FUTURE PRIORITY AND CC
746 002566 000003              TRT
747 002570 100001      RETF4:  BPL      .+4      ;TEST FOR 'C' CLEARED
748 002572 000000              HLT      ;C NOT CLEARED
749 002574 001001              BNE      .+4
750 002576 000000              HLT      ;Z NOT CLEARED
751 002600 102001              BVC      .+4
752 002602 000000              HLT      ;V NOT CLEARED
753 002604 103001              BCC      .+4
754 002606 000000              HLT      ;C NOT CLEARED
755 002610 032767 000340 175160  BIT      #3+0,CC      ;TEST PRIORITY
756 002616 001401              BEQ      .+4
757 002620 000000              HLT      ;PRIORITY NOT ZERO
758 002622 010700              SCOPE
759 002624 012706 010340      MOV      #BUFF,LP
760 002630 012767 002646 175156  MOV      #RETG4,RTRAP4
761 002636 012767 000357 175152  MOV      #357,RTRAP4+2 ;SET NEW 'CC' AND PRIORITY
762 002644 000003              TRT      ;TRAP HERE

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763 002646 100401          RETG4: BMI      .+4
764 002650 000000          HLT
765 002652 001401          BEQ      .+4          ;N NOT SET
766 002654 000000          HLT          ;Z NOT SET
767 002656 102401          BVS      .+4
768 002660 000000          HLT          ;V NOT SET
769 002662 103401          BCS      .+4
770 002664 000000          HLT          ;C NOT SET
771 002666 016706 175104    MOV      CC,LP
772 002672 042706 000017    BIC      #17,LP
773 002676 022706 000340    CMP      #340,LP
774 002702 001401          BEQ      .+4
775 002704 000000          HLT          ;PRIORITY WAS CHANGED
776 002706 010700          SCOPE
777 002710 012767 000016 175076    MOV      #16,14
778 002716 005067 175074    CLR      16
779
780          ;PDP-11 ILLEGAL AND ADDRESS INSTRUCTION TEST
781          ;ALL INSTRUCTIONS THAT ARE RESERVED
782          ;SHOULD TRAP TO LOCATION 4, AND THE
783          ;PC THAT POINTS TO THE TRAPPING INSTRUCTION
784          ;SHOULD BE PLACED ON THE STACK
785
786          ;TEST THAT A TRAP OCCURS ON AN ILLEGAL INSTRUCTION
787 002722 010700          SCOPE
788 002724 012706 010340    MOV      #BUFF,LP          ;LINK POINTER SETUP
789 002730 012767 002742 175046    MOV      #RETA5,RTRAP5    ;RETURN LOCATION
790 002736 000100          JMP      %0                ;ILLEGAL INSTRUCTION, SHOULD TRAP
791 002740 000000          HLT
792 002742 010700          RETA5: SCOPE
793
794          ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
795 002744 012706 010340    MOV      #BUFF,LP          ;LINK POINTER SETUP
796 002750 012767 002760 175026    MOV      #RETB5,RTRAP5    ;RETURN POINTER
797 002756 000100          JMP      %0                ;RESERVED INSTRUCTION
798 002760 020627 010334    RETB5: CMP      LP,#BUFF-4 ;TEST DECREMENT OF LP
799 002764 001401          BEQ      .+4
800 002766 000000          HLT          ;NOT DECREMENTED TWO WORDS
801 002770 010700          SCOPE
802
803          ;TEST THAT PROPER P.C. IS SAVED
804 002772 012706 010340    MOV      #BUFF,LP          ;LINK POINTER SETUP
805 002776 012767 003006 175000    MOV      #RETC5,RTRAP5    ;RETURN FROM TRAP POINTER
806 003004 000100          JMP      %0                ;TRAP ON THIS INSTRUCTION
807 003006 022767 003006 005320    RETC5: CMP      #,BUFF-4    ;CHECK FOR INCREMENTED P.C.
808 003014 001401          BEQ      .+4
809 003016 000000          HLT          ;INCORRECT P.C.
810 003020 010700          SCOPE
811
812          ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
813 003022 010700          SCOPE
814 003024 012706 010340    MOV      #BUFF,LP          ;SET UP
815 003030 012767 003046 174746    MOV      #RETD5,RTRAP5    ;SET UP
816 003036 005067 174734    CLR      CC                ;CLEAR CC AND PRIORITY
817 003042 000257          CCC
818 003044 000100          JMP      %0                ;TRAP

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819 003046 026727 005264 000000 RETD5:  CMP      BUFF-2,#0      ;TEST THAT OLD STATUS WENT TO STACK
820 003054 001401          BEQ      .+4          ;TEST FOR ALL ZEROS
821 003056 000000          HLT          ;INCORRECT STATUS
822 003060 010700          SCOPE
823 003062 012706 010340      MOV      #BUFF,LP      ;SET UP
824 003066 012767 003106 174710      MOV      #RETE5,RTRAP5 ;SET UP
825 003074 012767 000357 174674      MOV      #357,CC       ;SET PRIORITY
826 003102 000277          SCC          ;SET CC
827 003104 000100          JMP      %0           ;TRAP
828 003106 026727 005224 000357 RETE5:  CMP      BUFF-2,#357   ;COMPARES STATUS ON STACK
829 003114 001401          BEQ      .+4          ;TEST FOR ALL ONES
830 003116 000000          HLT          ;INCORRECT STATUS ON STACK
831 003120 010700          SCOPE
832
833          ;TEST THAT 'NEW' STATUS IS CORRECT
834 003122 012706 010340      MOV      #BUFF,LP
835 003126 012767 003142 174650      MOV      #RETF5,RTRAP5
836 003134 005067 174646      CLR      RTRAP5+2     ;CLEAR FUTURE PRIORITY AND CC
837 003140 000100          JMP      %0
838 003142 100001      RETF5:  BPL      .+4     ;TEST FOR 'C' CLEARED
839 003144 000000          HLT          ;C NOT CLEARED
840 003146 001001          BNE      .+4
841 003150 000000          HLT          ;Z NOT CLEARED
842 003152 102001          BVC      .+4
843 003154 000000          HLT          ;V NOT CLEARED
844 003156 103001          BCC      .+4
845 003160 000000          HLT          ;C NOT CLEARED
846 003162 032767 000357 174606      BIT      #357,CC      ;TEST PRIORITY
847 003170 001401          BEQ      .+4
848 003172 000000          HLT          ;PRIORITY NOT ZERO
849 003174 010700          SCOPE
850 003176 012706 010340      MOV      #BUFF,LP
851 003202 012767 003220 174574      MOV      #RETG5,RTRAP5
852 003210 012767 000357 174570      MOV      #357,RTRAP5+2 ;SET NEW 'CC' AND PRIORITY
853 003216 000100          JMP      %0           ;TRAP HERE
854 003220 100401      RETG5:  BMI      .+4
855 003222 000000          HLT          ;N NOT SET
856 003224 001401          BEQ      .+4
857 003226 000000          HLT          ;Z NOT SET
858 003230 102401          BVS      .+4
859 003232 000000          HLT          ;V NOT SET
860 003234 103401          BCS      .+4
861 003236 000000          HLT          ;C NOT SET
862 003240 016706 174532      MOV      CC,LP
863 003244 022706 000357      CMP      #357,LP
864 003250 001401          BEQ      .+4
865 003252 000000          HLT          ;PRIORITY WAS CHANGED
866
867          ;TEST THAT A TRAP OCCURS ON ALL ILLEGAL INSTRUCTION
868 003254 010700          SCOPE
869 003256 012706 010340      MOV      #BUFF,LP
870 003262 012767 003274 174514      MOV      #RETH5,RTRAP5 ;LINK POINTER SETUP
871 003270 004000          JSR      %0,%0        ;RETURN POINTER
872 003272 000000          HLT          ;RESERVED INSTRUCTION
873 003274 010700      RETH5:  SCOPE
874

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875 ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
876 003276 012706 010340 MOV #BUFF,LP
877 003302 012767 003312 174474 MOV #RETJ,RTRAP5
878 003310 004000 JSR %0,%0
879 003312 020627 010334 RETJ: CMP LP,#BUFF-4 ;TEST DECREMENT OF LP
880 003316 001401 BEQ .+4
881 003320 000000 HLT ;NOT DECREMENTED TWO WORDS
882 003322 010700 SCOPE
883
884 ;TEST THAT PROPER P.C. IS SAVED
885 003324 012706 010340 MOV #BUFF,LP ;LINK POINTER SETUP
886 003330 012767 003340 174446 MOV #RETK,RTRAP5 ;RETURN FROM TRAP POINTER
887 003336 004000 INSTK: JSR %0,%0 ;TRAP ON THIS INSTRUCTION
888 003340 022767 003340 004766 RETK: CMP #INSTK+2,BUFF-4 ;CHECK FOR INCREMENTED P.C.
889 003346 001401 BEQ .+4
890 003350 000000 HLT ;INCORRECT P.C.
891 003352 010700 SCOPE
892
893 ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
894 003354 010700 SCOPE
895 003356 012706 010340 MOV #BUFF,LP ;SET UP
896 003362 012767 003400 174414 MOV #RETL,RTRAP5 ;SET UP
897 003370 005067 174402 CLR CC ;CLEAR CC AND PRIORITY
898 003374 000257 CCC
899 003376 004000 JSR %0,%0 ;TRAP
900 003400 026727 004732 000000 RETL: CMP BUFF-2,#0 ;TEST THAT OLD STATUS WENT TO STACK
901 003406 001401 BEQ .+4 ;TEST FOR ALL ZEROS
902 003410 000000 HLT ;INCORRECT STATUS
903 003412 010700 SCOPE
904 003414 012706 010340 MOV #BUFF,LP ;SET UP
905 003420 012767 003440 174356 MOV #RETM,RTRAP5 ;SET UP
906 003426 012767 000357 174342 MOV #357,CC ;SET PRIORITY
907 003434 000277 SCC ;SET CC
908 003436 004000 JSR %0,%0 ;TRAP
909 003440 026727 004672 000357 RETM: CMP BUFF-2,#357 ;COMPARES STATUS ON STACK
910 003446 001401 BEQ .+4 ;TEST FOR ALL ONES
911 003450 000000 HLT ;INCORRECT STATUS ON STACK
912 003452 010700 SCOPE
913
914 ;TEST THAT 'NEW' STATUS IS CORRECT
915 003454 012706 010340 MOV #BUFF,LP
916 003460 012767 003474 174316 MOV #RETN,RTRAP5
917 003466 005067 174314 CLR RTRAP5+2 ;CLEAR FUTURE PRIORITY AND CC
918 003472 004000 JSR %0,%0
919 003474 100001 RETN: BPL .+4 ;TEST FOR 'C' CLEARED
920 003476 000000 HLT ;C NOT CLEARED
921 003500 001001 BNE .+4
922 003502 000000 HLT ;Z NOT CLEARED
923 003504 102001 BVC .+4
924 003506 000000 HLT ;V NOT CLEARED
925 003510 103001 BCC .+4
926 003512 000000 HLT ;C NOT CLEARED
927 003514 016700 174256 MOV CC,%0 ;TEMP STORAGE
928 003520 001401 BEQ .+4
929 003522 000000 HLT ;PRIORITY NOT ZERO
930 003524 010700 SCOPE

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931 003526 012706 010340      MOV      #BUFF,LP
932 003532 012767 003550 174244  MOV      #RETO,RTRAP5
933 003540 012767 000357 174240  MOV      #357,RTRAP5+2      ;SET NEW 'CC' AND PRIORITY
934 003546 004000      JSR      %0,%0              ;TRAP HERE
935 003550 100401      RETO:    BMI      .+4
936 003552 000000      HLT
937 003554 001401      BEQ      .+4                ;N NOT SET
938 003556 000000      HLT
939 003560 102401      BVS      .+4                ;Z NOT SET
940 003562 000000      HLT
941 003564 103401      BCS      .+4                ;V NOT SET
942 003566 000000      HLT
943 003570 016700 174202  MOV      CC,%0
944 003574 022700 000357  CMP      #357,%0
945 003600 001401      BEQ      .+4
946 003602 000000      HLT
947 003604 010700      SCOPE                      ;PRIORITY WAS CHANGED
948
949                      ;TEST THAT A TRAP OCCURS ON AN ILLEGAL ADDRESS
950 003606 010700      SCOPE
951 003610 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
952 003614 012767 003630 174162  MOV      #RETP,RTRAP5      ;RETURN LOCATION
953 003622 005767 174153  TST 1                      ;ILLEGAL ADDRESS INSTRUCTION, SHOULD TRAP
954 003626 000000      HLT
955 003630 010700      RETP:    SCOPE              ;ILLEGAL ADDRESS DID NOT TRAP
956
957                      ;TEST DECREMENT OF LINK POINTER ON A TRAP OPERATION
958 003632 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
959 003636 012767 003650 174140  MOV      #RETO,RTRAP5      ;RETURN POINTER
960 003644 005767 174131  TST 1                      ;RESERVED INSTRUCTION
961 003650 020627 010334  RETO:    CMP      LP,#BUFF-4 ;TEST DECREMENT OF LP
962 003654 001401      BEQ      .+4
963 003656 000000      HLT
964 003660 010700      SCOPE                      ;NOT DECREMENTED TWO WORDS
965
966                      ;TEST THAT PROPER P.C. IS SAVED
967 003662 012706 010340      MOV      #BUFF,LP          ;LINK POINTER SETUP
968 003666 012767 003700 174110  MOV      #RETR,RTRAP5      ;RETURN FROM TRAP POINTER
969 003674 005767 174101  TST 1                      ;TRAP ON THIS INSTRUCTION
970 003700 022767 003700 004426  RETR:    CMP      #.,BUFF-4  ;CHECK FOR INCREMENTED P.C.
971 003706 001401      BEQ      .+4
972 003710 000000      HLT
973 003712 010700      SCOPE                      ;INCORRECT P.C.
974
975                      ;TEST THAT 'OLD' CC AND PRIORITY ARE PLACED ON STACK
976 003714 010700      SCOPE
977 003716 012706 010340      MOV      #BUFF,LP          ;SET UP
978 003722 012767 003742 174054  MOV      #RETS,RTRAP5      ;SET UP
979 003730 005067 174042  CLR      CC                ;CLEAR CC AND PRIORITY
980 003734 000257  CCC
981 003736 005767 174037  TST 1                      ;TRAP
982 003742 026727 004370 000000  RETS:    CMP      BUFF-2,#0  ;TEST THAT OLD STATUS WENT TO STACK
983 003750 001401      BEQ      .+4                ;TEST FOR ALL ZEROS
984 003752 000000      HLT
985 003754 010700      SCOPE                      ;INCORRECT STATUS
986 003756 012706 010340      MOV      #BUFF,LP          ;SET UP
    
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987 003762 012767 004004 174014      MOV      #RETT,RTRAP5      ;SET UP
988 003770 012767 000357 174000      MOV      #357,CC          ;SET PRIORITY
989 003776 000277                SCC                ;SET CC
990 004000 005767 173775                TST 1                ;TRAP
991 004004 026727 004326 000357 RETT:  CMP      BUFF-2,#357      ;COMPARES STATUS ON STACK
992 004012 001401                BEQ      .+4           ;TEST FOR ALL ONES
993 004014 000000                HLT                               ;INCORRECT STATUS ON STACK
994 004016 010700                SCOPE
995
996                                ;TEST THAT 'NEW' STATUS IS CORRECT
997 004020 012706 010340                MOV      #BUFF,LP
998 004024 012767 004042 173752      MOV      #RETV,RTRAP5
999 004032 005067 173750                CLR      RTRAP5+2        ;CLEAR FUTURE PRIORITY AND CC
1000 004036 005767 173737      TST 1                ;TRAP HERE
1001 004042 100001      RETU:  BPL      .+4           ;TEST FOR 'C' CLEARED
1002 004044 000000                HLT                               ;C NOT CLEARED
1003 004046 001001                BNE      .+4           ;Z NOT CLEARED
1004 004050 000000                HLT                               ;Z NOT CLEARED
1005 004052 102001                BVC      .+4           ;V NOT CLEARED
1006 004054 000000                HLT                               ;V NOT CLEARED
1007 004056 103001                BCC      .+4           ;C NOT CLEARED
1008 004060 000000                HLT                               ;C NOT CLEARED
1009 004062 032767 000357 173706      BIT      #357,CC        ;TEST PRIORITY FOR ZERO
1010 004070 001401                BEQ      .+4           ;PRIORITY NOT ZERO
1011 004072 000000                HLT
1012 004074 010700                SCOPE
1013 004076 012706 010340                MOV      #BUFF,LP
1014 004102 012767 004122 173674      MOV      #RETV,RTRAP5
1015 004110 012767 000357 173670      MOV      #357,RTRAP5+2  ;SET NEW 'CC' AND PRIORITY
1016 004116 005767 173657      TST 1                ;TRAP HERE
1017 004122 100401      RETV:  BMI      .+4           ;N NOT SET
1018 004124 000000                HLT                               ;N NOT SET
1019 004126 001401                BEQ      .+4           ;Z NOT SET
1020 004130 000000                HLT                               ;Z NOT SET
1021 004132 102401                BVS      .+4           ;V NOT SET
1022 004134 000000                HLT                               ;V NOT SET
1023 004136 103401                BCS      .+4           ;C NOT SET
1024 004140 000000                HLT                               ;C NOT SET
1025 004142 016700 173630      MOV      CC,%0
1026 004146 022700 000357      CMP      #357,%0
1027 004152 001401                BEQ      .+4
1028 004154 000000                HLT
1029 004156 010700                SCOPE
1030
1031                                ;TEST THAT BIT 4; 20(8) WILL CAUSE A TRAP TO 14
1032 004160 010700                SCOPE
1033 004162 012706 010340                MOV      #BUFF,LP
1034 004166 012767 004206 173620      MOV      #RETAT,RTRAP4  ;SET UP TO TRAP TO 14
1035 004174 052767 000020 173574      BIS      #20,CC        ;SET TRACE BIT
1036 004202 000240                NOP                ;TRAP HERE
1037 004204 000000                HLT                               ;TRACE BIT DOES NOT TRAP
1038 004206 010700      RETAT:  SCOPE
1039
1040                                ;TEST LINK POINTER DECREMENTS
1041 004210 012706 010340                MOV      #BUFF,LP
1042 004214 012767 004230 173572      MOV      #RETB,RTRAP4
    
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1043 004222 052767 000020 173546
1044 004230 020627 010334
1045 004234 001401
1046 004236 000000
1047 004240 010700
1048
1049
1050 004242 012706 010340
1051 004246 012767 004264 173540
1052 004254 052767 000020 173514
1053 004262 000240
1054 004264 022767 004264 004042
1055 004272 001401
1056 004274 000000
1057 004276 010700
1058
1059
1060 004300 012706 000150
1061 004304 012767 004316 173472
1062 004312 005746
1063 004314 000000
1064 004316 010700
1065
1066
1067 004320 012706 000150
1068 004324 012767 004334 173452
1069 004332 005746
1070 004334 020627 000142
1071 004340 001401
1072 004342 000000
1073 004344 010700
1074
1075
1076 004346 012706 000150
1077 004352 005067 173570
1078 004356 012767 004366 173420
1079 004364 005246
1080 004366 005767 173554
1081 004372 001001
1082 004374 000000
1083 004376 010700
1084 004400 012705 001000
1085 004404 012706 000400
1086 004410 012767 004422 173366
1087 004416 124645
1088 004420 000000
1089 004422 010700
1090
1091 004424 012706 000400
1092 004430 012767 004442 173346
1093 004436 134546
1094 004440 000000
1095 004442 010700
1096 004444 000407
1097 004446 010700
1098

RETBT: BIS #20,CC
        CMP LP,#BUFF-4
        BEQ .+4
        HLT ;STACK POINTER WAS NOT PUSHED BY TRAP
        SCOPE
;TEST FOR PROPER PC ON STACK

MOV #BUFF,LP
MOV #RETCT,RTRAP4
BIS #20,CC
NOP ;TRAP HERE
RETCT: CMP #,BUFF-4
        SEQ .+4
        HLT ;CORRECT PC WAS NOT SAVED ON STACK
        SCOPE

;TEST THAT DECREMENT R6 TO A VALUE LESS THAN 400 TRAPS
MOV #150,%6 ;R6 = 150
MOV #TDEC1,4 ;STACK OVERFLOW TRAP POINTER
TST -(6) ;WITH R6 = 150 SHOULD TRAP
HLT ;AUTO DECREMENT WITH R6 LESS THAN 400
TDEC1: SCOPE ;DID NOT TRAP

;TEST FOR DECREMENT OF R6 ON OVERFLOW TRAP
MOV #150,%6 ;R6 = 150
MOV #TDEC2,4 ;TRAP POINTER
TST -(6) ;WITH R6 = 150 SHOULD TRAP
TDEC2: CMP %6,#142 ;DID R6 DECREMENT
        BEQ .+4
        HLT ;R6 NOT = 142
        SCOPE

;TEST THAT OVERFLOW TRAP DOES NOT LOSE INFORMATION
MOV #150,%6
CLR 146 ;STATUS WORD OF LOC 10
MOV #TDEC3,4 ;RETURN TO LOC 4
INC -(6)
TDEC3: TST 146
        BNE .+4
        HLT ;INCREMENT OPERATION NOT INHIBITED
        SCOPE

MOV #1000,%5
MOV #400,%6
MOV #TDEC4,4
CMPB -(6),-(5)
HLT ;STACK = 400 AND DECREMENTED, SHOULD TRAP
TDEC4: SCOPE

MOV #400,%6
MOV #TDEC5,4
BITB -(5),-(6)
HLT ;NO STACK OVERFLOW TRAP
TDEC5: SCOPE

BR TDEC6
TONT: SCOPE ;TEST TRAP ON TRAP - SHOULD CAUSE A HALT

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1099 004450 005006          CLR      %6
1100 004452 012767 004464 173324  MOV      #TDEC6,4
1101 004460 000146          JMP      -(6)
1102 004462 000000          HLT
1103 004464 010700          TDEC6:  SCOPE          ;TRAP ON TRAP SHOULD HALT
1104          .MACR      VTRP      INST,A, B,DEST
1105
1106          ;TEST THAT AN INST CAUSES AN OVERFLOW TRAP
1107          MOV      #400,%6          ;SET UP STACK TO OVERFLOW
1108          MOV      #VDEC'B,DEST    ;SET UP INST VECTOR
1109          MOV      #VDEC'A,4      ;SET UP OVERFLOW VECTOR
1110          INST          ;THIS TRAP SHOULD CAUSE OVERFLOW
1111          HLT          ;NO TRAP OCCURRED
1112          VDEC'B':HLT          ;TRAP FLAG OVERFLOW DID NOT OCCUR
1113          VDEC'A':SCOPE          ;NORMAL OVERFLOW RETURN
1114          .ENDM
1115
1116 004466          VTRP      70000,1,2,10
1117 004516          VTRP      IOT,3,4,20
1118 004546          VTRP      EMT,5,6,30
1119 004576          VTRP      TRAP,7,8,34
1120 004626          VTRP      TRT,9,10,14
1121 004656          VTRP      ILLA,12,11,4
1122 004706 020627 000370  CMP      %6,#370          ;STACK PUSHED FOUR WORDS?
1123 004712 001401          BEQ
1124 004714 000000          HLT
1125 004716          VTRP      ILLB,14,13,4          ;TRAP OVERFLOW DID NOT OCCUR
1126
1127          ;TEST FOR FALSE OVERFLOW TRAP
1128          ;PROGRAM MAY HAVE RELOADED IF OVERFLOW FAILS
1129
1130 004746 012767 005014 173030  MOV      #FOVER,4          ;SET UP OVERFLOW POINTER
1131 004754 012706 001002          MOV      #1002,%6
1132 004760 005746          TST      -(6)          ;SHOULD NOT OVERFLOW
1133 004762 012706 002002          MOV      #2002,%6
1134 004766 005746          TST      -(6)          ;SHOULD NOT OVERFLOW
1135 004770 012706 004002          MOV      #4002,%6
1136 004774 005746          TST      -(6)          ;SHOULD NOT OVERFLOW
1137 004776 012706 010002          MOV      #10002,%6
1138 005002 005746          TST      -(6)
1139 005004 012706 020000          MOV      #20000,%6          ;SHOULD NOT OVERFLOW
1140 005010 005746          TST      -(6)
1141 005012 000401          BR
1142 005014 000000          FCOVER: HLT          ;FALSE OVERFLOW OCCURRED
1143 005016 010700          SCOPE          ;CHECK STACK TO FIND WHERE
1144
1145          ;TEST THAT A TTY INTERRUPT CAUSES AN OVERFLOW TRAP
1146 005020 012767 000340 172750  MOV      #340,STATUS      ;LOCK OUT INTERRUPT
1147 005026 012706 000400          MOV      #400,%6          ;SET UP STACK TO OVERFLOW
1148 005032 012767 005064 172744  MOV      #TDEC7,4          ;SET UP OVERFLOW TRAP
1149 005040 012767 005062 173016  MOV      #TDEC8,64         ;SET UP INTERRUPT VECTOR
1150 005046 012767 000100 172510  MOV      #100,TTCSR        ;SET INTERRUPT ENABLE
1151 005054 005067 172716          CLR      STATUS          ;ALLOW INTERRUPT TO OCCUR
1152 005060 000000          HLT          ;NO INTERRUPT OCCURRED
1153 005062 000000          TDEC8: HLT          ;TRAP FLAG OVERFLOW DID NOT OCCUR
1154 005064 005067 172474          TDEC7: CLR      TTCSR        ;CLEAR INTERRUPT ENABLE

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1155 005070 010700          SCOPE
1156 005072 012706 010340  MOV    #BUFF,LP          ;SCOPE PROTECTION
1157 005076 012767 000006 172700  MOV    #6,4
1158 005104 005067 172674          CLR    4
1159 005110 012767 006316 172666  MOV    #ATRAP,RTRAP5
1160 005116 000167 000034          JMP    R7TRX              ;GO TO ILLEGAL ADDRESS TEST
1161 005122 012706 010340          MOV    #BUFF,LP          ;SCOPE PROTECTION
1162 005126 012767 000006 172650  MOV    #6,4
1163 005134 005067 172644          CLR    4
1164 005140 012767 006316 172636  MOV    #ATRAP,RTRAP5
1165 005146 000167 000004          JMP    R7TRX              ;GO TO ILLEGAL ADDRESS TEST
1166 005152 000000          MAP:    0
1167 005154 000000          MAPT:   0
1168          000000          HERE=0
1169
1170          ;DOES THE PROCESSOR TRAP WHEN %7 IS ODD?
1171 005156 010700          R7TRX: SCOPE
1172 005160 012706 010340          MOV    #BUFF,%6          ;SET UP STACK POINTER
1173 005164 012767 005202 172612  MOV    #R7TR1,4          ;RETURN FROM TRAP
1174 005172 012707 000001          MOV    #1,%7             ;PC EQUALS ONE
1175 005176 000000          HLT
1176 005200 000000          HLT
1177 005202 022767 000001 003124  R7TR1: CMP    #1,BUFF-4
1178 005210 001401          BEQ    .+4               ;CORRECT PC WAS NOT SAVED ON STACK
1179 005212 000000          HLT
1180
1181 005214 010700          SCOPE
1182 005216 012706 010340          MOV    #BUFF,%6          ;STACK POINTER
1183 005222 012767 005236 172554  MOV    #R7TR2,4
1184 005230 005207          INC    %7                ;PC BECOMES ODD
1185 005232 000000          R7TR2A: HLT
1186 005234 000000          HLT
1187 005236 022767 005233 003070  R7TR2: CMP    #R7TR2A+1,BUFF-4
1188 005244 001401          SEQ    .+4               ;CORRECT PC NOT ON STACK
1189 005246 000000          HLT
1190 005250 010700          SCOPE
1191 005252 012706 010340          MOV    #BUFF,%6
1192 005256 012767 005270 172520  MOV    #R7TR3,4
1193 005264 005307          DEC    %7                ;MAKE PC ODD
1194 005266 000000          HLT                      ;SHOULD TRAP
1195 005270 022767 005265 003036  R7TR3: CMP    #-3,BUFF-4   ;CHECK VALUE OF PC ON STACK
1196 005276 001401          BEQ    .+4
1197 005300 000000          HLT                      ;WRONG VALUE ON STACK
1198
1199 005302 010700          SCOPE
1200 005304 012706 010340          MOV    #BUFF,%6
1201 005310 012767 005326 172466  MOV    #R7TR4,4
1202 005316 000261          SEC
1203 005320 006107          ROL    %7                ;CARRY EQUALS A 1
1204 005322 000000          TR4A:  HLT                ;PC BECOMES ODD
1205 005324 000000          HLT
1206 005326 022767 012645 003000  R7TR4: CMP    #TR4A+TR4A+1,BUFF-4 ;CHECK FOR VALUE ON STACK
1207 005334 001401          BEQ    .+4
1208 005336 000000          HLT                      ;WRONG VALUE ON STACK
1209 005340 012767 000006 172436  MOV    #0,4              ;RESET UP A HALT FOR TRAP
1210

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1211 ;TEST TRAP ON TRAP
1212 ;TEST THAT TRACE BIT TRAPS ARE INHIBITED ON TRAP INST
1213 005346 010700 SCOPE
1214 005350 012706 010340 MOV #BUFF,%6 ;SET UP STACK POINTER
1215 005354 012767 005434 172432 MOV #TRC1,14 ;TRACE TRAP RETURN
1216 005362 005027 000016 CLR 16
1217 005366 012767 005410 172424 MOV #TONT1,20 ;SET THE T BIT
1218 005374 005067 000054 CLR FLAG ;CHECK FOR T BIT ON STACK
1219 005400 052767 000020 172370 BIS #20,STATUS ;T BIT NOT SAVED ON STACKED
1220 005406 000004 IOT ;TRAP, NEW CC HAVE TRACE RESET
1221 005410 100001 TONT1: BPL .+4 ;IF TRACE TRAP OCCURRED WILL BRANCH
1222 005412 000000 HLT ;NO TRACE TRAP AT END OF IOT INST.
1223 005414 010700 SCOPE
1224 005416 012767 000016 172370 MOV #16,14
1225 005424 012767 000022 172366 MOV #22,20
1226 005432 000411 BR FLAG+2
1227 005434 012767 177777 000012 TRACE: MOV #-1,FLAG ;SET FLAG DURING TRACE
1228 005442 005767 000006 TST FLAG
1229 005446 001401 BEQ .+4
1230 005450 000000 HLT ;TRACE TRAP NOT INHIBITED
1231 005452 000002 RTI ;TRAP
1232 005454 000000 FLAG: 0
1233
1234 ;TEST THAT THE TRACE BIT WILL CAUSE A TRAP
1235 005456 010700 SCOPE
1236 005460 012706 010340 MOV #BUFF,%6 ;SET UP STACK POINTER
1237 005464 012767 005510 172322 MOV #TRC1,14 ;TRACE TRAP RETURN
1238 005472 005067 172320 CLR 16
1239 005476 012767 000020 172272 MOV #20,CC ;SET THE T BIT
1240 005504 000240 NOP
1241 005506 000000 HLT
1242 005510 036727 002622 000020 TRC1: BIT BUFF-2,#20 ;CHECK FOR T BIT ON STACK
1243 005516 001001 BNE .+4
1244 005520 000000 HLT
1245 005522 010700 SCOPE
  
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1246 ;TEST THAT AN RTI POPS THE T BIT
1247 005524 012706 010340      MOV #BUFF,%6      ;SET UP THE STACK
1248 005530 012746 000020      MOV #20,-(6)      ;FUTURE T BIT ON STACK
1249 005534 012746 005550      MOV #TRC2,-(6)    ;RTI RETURN
1250 005540 012767 005554 172246  MOV #TRC3,14      ;TRACE TRAP INTERRUPT POINTER
1251 005546 000002
1252 005550 000240      TRC2: NOP          ;TRACE IS SET SHOULD TRAP TO 14
1253 005552 000000      HLT              ;DID NOT TRACE TRAP
1254 005554 010700      TRC3: SCOPE
1255
1256 ;TEST THAT AN RTI CLEARS THE T BIT
1257 005556 012706 010340      MOV #BUFF,%6      ;SET UP STACK
1258 005562 012746 000340      MOV #340,-(6)     ;FUTURE PSW ON STACK
1259 005566 012746 005576      MOV #TRC4,-(6)    ;RTI RETURN
1260 005572 000002      RTI
1261 005574 000000      HLT              ;DID NOT RTI
1262 005576 032767 000020 172172  TRC4: BIT #20,STATUS ;TEST FOR T BIT
1263 005604 001401      BEQ TRC5
1264 005606 000000      HLT              ;RTI FAILED TO CLEAR T BIT
1265 005610 010700      TRC5: SCOPE
1266
1267
1268 ;TEST THAT INTERRUPT OCCURS BEFORE TRAP
1269 005612 010700      SCOPE
1270 005614 012706 010340      MOV #BUFF,%6
1271 005620 012767 000340 172150  MOV #340,STATUS   ;HIGHEST PRIORITY LEVEL
1272 005626 012767 000100 171730  MOV #100,TTCSR    ;INTERRUPT FOR TTY PUNCH/PRINTER
1273 005634 012767 005664 172172  MOV #TR1,34       ;TRAP VECTOR
1274 005642 012767 005666 172214  MOV #TR2,64       ;TTY VECTOR
1275 005650 012767 000340 172160  MOV #340,36       ;IF TRAP TRAPS, MOVE 340 TO PRIORITY
1276 005656 005067 172114      CLR STATUS        ;SHOULD TRAP AT END OF CLR INST
1277 005662 104400      TRAP              ;TTY INTERRUPT SHOULD OVERRIDE TRAP
1278 005664 000000      TR1: HLT          ;TRAP DID NOT OCCUR FIRST
1279 005666 005067 172144      TR2: CLR 36       ;TRAP PRIORITY=0
1280 005672 010700      SCOPE
1281
1282 ;WILL INTERRUPTS OCCURE BETWEEN TRAPS
1283 005674 012706 010340      MOV #BUFF,%6
1284 005700 012767 000340 172070  MOV #340,STATUS
1285 005706 012767 000100 171650  MOV #100,TTCSR
1286 005714 012767 005746 172112  MOV #TR3,34       ;TRAP
1287 005722 012767 005750 172134  MOV #TR5,64       ;TTY OUTPUT
1288 005730 012767 005752 172062  MOV #TR4,20       ;IOT
1289 005736 012767 000340 172056  MOV #340,22       ;IOT PRIORITY
1290 005744 104400      TRAP              ;THE ACT OF TRAPPING LOWER PRIORITY
1291 005746 000004      TR3: IOT          ;INTERRUPT SHOULD OCCURE INPLACE OF IOT TRAP
1292 005750 000000      TR5: HLT
1293 005752 005067 172044      TR4: CLR 22       ;NO INTERRUPT BETWEEN TRAPS
1294 005756 010700      SCOPE              ;CLR IOT PRIORITY
1295
1296 ;TEST THAT 'RESET' GOES TO OUTSIDE WORLD
1297 005760 010700      SCOPE
1298 005762 012767 000100 171574  MOV #100,TTCSR    ;SET INTERRUPT ENABLE
1299 005770 012767 000100 171562  MOV #100,TRCSR    ;SET INTERRUPT ENABLE
1300 005776 000005      RESET            ;SHOULD CLEAR INTERRUPT ENABLE
1301 006000 032767 000100 171556  BIT #100,TTCSR    ;TEST FOR CLEAR

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1302 006006 001401          BEQ      .+4
1303 006010 000000          HLT
1304 006012 032767 000100 171540 BIT      #100,TRCSR      ;RESET FAILED TO CLEAR TTCSR
1305 006020 001401          BEQ      .+4          ;TEST FOR CLEAR
1306 006022 000000          HLT          ;RESET FAILED TO CLEAR TRCSR
1307
1308          ;TEST THAT RESET DOES NOT HANG THE SYSTEM
1309 006024 010700          SCOPE
1310 006026 012706 010340    MOV      #BUFF,%6      ;SET STACK
1311 006032 005067 171740    CLR      STATUS        ;ALLOW INTERRUPT
1312 006036 012767 006052 172020 MOV      #RESET1,64     ;TTY INTERRUPT VECTOR
1313 006044 052767 000100 171512 BIS      #100,TTCSR     ;SET INTERRUPT ENABLE
1314 006052 000005          RESET1: RESET          ;IF THIS HANGS CHECK SACK
1315 006054 012767 000066 172002 MOV      #66,64         ;FOR FALSE INTERRUPT
1316
1317          ;TEST RESET WITH TRACE ON
1318 006062 010700          SCOPE
1319 006064 012706 010340    MOV      #BUFF,%6      ;SET STACK
1320 006070 012767 006112 171716 MOV      #RESET2,14     ;SET UP TRACE VECTOR
1321 006076 012767 000020 171672 MOV      #20,STATUS     ;SET T BIT IN STATUS REGISTER
1322 006104 000005          RESET          ;SHOULD HAVE NO EFFECT
1323 006106 000005          RESET          ;NO EFFECT
1324 006110 000000          HLT          ;TRACE TRAP FAILED
1325 006112 005067 171660    RESET2: CLR      STATUS ;CLEAR TRACK
1326 006116 005067 171674    CLR      16            ;TRACE STATUS
1327
1328          ;TEST THAT WHEN TTY INTERRUPTS IT POPS NEW STATUS
1329 006122 000005          RESET
1330 006124 012706 010340    MOV      #BUFF,%6      ;SET UP STACK
1331 006130 012767 006154 171726 MOV      #TTY3,64       ;INTERRUPT VECTOR
1332 006136 005067 171634    CLR      STATUS        ;DROP PROCESSOR PRIORITY
1333 006142 012767 000357 171716 MOV      #357,66        ;HIGH PRIORITY ON INTERRUPT
1334 006150 005167 171410    COM     TTCSR          ;SHOULD SET INTERRUPT ENABLE & INTERRUPT
1335 006154 016727 171616 000000 TTY3: MOV      STATUS,#HERE ;SAVE PROCESSOR STATUS
1336 006162 022767 000357 177770 CMP      #357,..-2
1337 006170 001401          BEQ      .+4
1338 006172 000000          HLT          ;INTERRUPT DID NOT POP CORRECT STATUS
1339 006174 000005          RESET          ;CLR INTERRUPT ENABLF
1340 006176 010700          SCOPE
1341
1342 006200 012706 010340    MOV      #BUFF,%6      ;STACK SET UP
1343 006204 012767 006230 171652 MOV      #TTY4,64       ;INTERRUPT VECTOR
1344 006212 005067 171650    CLR      66            ;CLR NEW STATUS
1345 006216 012767 000157 171552 MOV      #157,STATUS    ;PROCESSOR STATUS
1346 006224 005167 171334    COM     TTCSR          ;SET INTERRUPT ENABLE
1347 006230 016727 171542 000000 TTY4: MOV      STATUS,#HERE ;SAVE NEW STATUS
1348 006236 005767 177772    TST     -2
1349 006242 001401          BEQ      .+4
1350 006244 000000          HLT          ;INTERRUPT DID NOT POP CORRECT STATUS
1351 006246 005067 171312    CLR     TTCSR
1352 006252 000167 000010    JMP     ADALL
1353
1354          ;ILLEGAL ADDRESS AND INSTRUCTION TEST FOR PDP11
1355          ;THIS ROUTINE TEST THAT NO LEGAL ADDRESS
1356          ;TRAPS AND THAT AN ILLEGAL ADDRESS TRAPS TO LOCATION 4:
1357

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```
1358 006256 160002      TSH: 160002
1359 006260 000000      TSL: 0
1360 006262 000000      CORL: 0
1361 006264 020000      CORH: 20000      ;CHANGE TO 40000 FOR 8K
1362
1363 006266 016700 177770 ADALL: MOV CORL,%0      ;LL OF CORE TO REG ZERO
1364 006272 012767 006316 171504 MOV #ATRAP,4      ;SET UP ADDRESS TRAP ENTRANCE
1365 006300 012706 010340 NOR: MOV #BUFF,LP
1366 006304 105720 TSTB (0)+      ;IF OUT SIDE OF CORE, TRAP TO 4
1367 006306 020067 177752 CMP %0,CORH      ;IS POINTER IN SIDE CORE
1368 006312 101772 BLOS NOR      ;TEST THE REST OF CORE
1369 006314 000000 AUTO: HLT      ;OUTSIDE OF HIGH CORE, DID YOU USE CORRECT STARTING ADDR
1370
1371 ;RETURN HERE ON AN ADDRSS TRAP
1372 006316 020067 177742 ATRAP: CMP %0,CORH      ;SHOULD WE HAVE TRAPPED
1373 006322 101001 BHI TRAPB
1374 006324 000000 AUTO1: HLT      ;NO, FALSE ADDRESS TRAP
1375 006326 020067 177724 TRAPB: CMP %0,TSH
1376 006332 001362 BNE NOR      ;SHOULD TRAP, NON EXISTANT CORE
1377 ;LOOP PROGRAM
1378 006334 010700 SCOPE
1379 006336 012767 000006 171440 MOV #6,4
1380 006344 005067 171436 CLR 6
1381
1382 ;SPECIAL CASE OF ODD: .EVEN .BYTE AND REGISTER 6
1383 000000 HERE-0
1384
1385 006350 000167 000024 JMP R6TST
1386 006354 000000 K1: 0
1387 006356 000000 K2: 0
1388 006360 000000 K3: 0
1389 006362 000000 K4: 0
1390 006364 000000 K5: 0
1391 006366 000000 K6: 0
1392 006370 052525 K7: 052525
1393 006372 052400 K10: 052400
1394 006374 000000 K11: 0
1395 006376 000000 K12: 0
1396
1397 ;TEST AUTO INCREMENT AND DECREMENT OF R6 FOR .WORD AND .BYTES
1398 006400 005006 R6TST: CLR %6
1399 006402 112667 171372 MOVB (6)+,HERE      ;SIX SHOULD INCREMENT BY TWO
1400 006406 020627 000002 CMP %6,#2
1401 006412 001401 BEQ .+4
1402 006414 000000 HLT      ;R6 DID NOT AUTO INCREMENT BY TWO
1403 006416 010700 SCOPE
1404
1405 006420 012706 001000 MOV #1000,%6
1406 006424 114627 000000 MOVB -(6),#HERE      ;SHOULD DECREMENT BY TWO
1407 006430 020627 000776 CMP %6,#776
1408 006434 001401 BEQ .+4
1409 006436 000000 HLT      ;R6 DID NOT AUTO DECREMENT BY 2
1410 006440 010700 SCOPE
1411
1412 006442 005006 CLR %6
1413 006444 112626 MOVB (6)+,(6)+      ;DOUBLE AUTO INCREMENT OF R6
```

1414	006446	020627	000004		CMP	%6,#4	
1415	006452	001401			BEQ	.+4	
1416	006454	000000			HLT		;WRONG AUTO INCREMENT OF R6
1417	006456	010700			SCOPE		
1418							
1419	006460	005006			CLR	%6	
1420	006462	005004			CLR	%4	
1421	006464	122624			CMPB	(6)+,(4)+	;TEST INCREMENT OF R6
1422	006466	020627	000002		CMP	%6,#2	
1423	006472	001401			BEQ	.+4	
1424	006474	000000			HLT		;WRONG INCREMENT OF R6
1425	006476	010700			SCOPE		
1426							
1427	006500	005006			CLR	%6	
1428	006502	005004			CLR	%4	
1429	006504	122426			CMPB	(4)+,(6)+	;TEST INCREMENT OF R6
1430	006506	020627	000002		CMP	%6,#2	
1431	006512	001401			BEQ	.+4	
1432	006514	000000			HLT		;WRONG INCREMENT OF R6
1433	006516	010700			SCOPE		
1434							
1435	006520	005006			CLR	%6	
1436	006522	005004			CLR	%4	
1437	006524	122624			CMPB	(6)+,(4)+	;TEST INCREMENT OF R4
1438	006526	020427	000001		CMP	%4,#1	
1439	006532	001401			BEQ	.+4	
1440	006534	000000			HLT		;WRONG INCREMENT OF R4
1441	006536	010700			SCOPE		
1442							
1443	006540	005006			CLR	%6	
1444	006542	005004			CLR	%4	
1445	006544	122426			CMPB	(4)+,(6)+	;TEST INCREMENT OF R6
1446	006546	020627	000002		CMP	%6,#2	
1447	006552	001401			BEQ	.+4	
1448	006554	000000			HLT		;WRONG INCREMENT OF R6
1449	006556	010700			SCOPE		
1450							
1451	006560	005006			CLR	%6	
1452	006562	005004			CLR	%4	
1453	006564	122426			CMPB	(4)+,(6)+	;TEST INCREMENT OF R4
1454	006566	020427	000001		CMP	%4,#1	
1455	006572	001401			BEQ	.+4	
1456	006574	000000			HLT		;WRONG INCREMENT OF R4
1457	006576	010700			SCOPE		
1458							
1459	006600	012706	001000		MOV	#1000,%6	
1460	006604	124627	000000		CMPB	-(6),#HERE	;TEST DECREMENT OF R6
1461	006610	022706	000776		CMP	#776,%6	
1462	006614	001401			BEQ	.+4	
1463	006616	000000			HLT		;WRONG DECREMENT OF R6
1464	006620	010700			SCOPE		
1465							
1466							
1467	006622	012767	123456	177534	MOV	#123456,K5	;TEST TRANSFER OF BYTE USING R6
1468	006630	012767	050505	177516	MOV	#050505,K1	
1469	006636	012705	006354		MOV	#K1,%5	;%5=(050505)K1

1470	006642	012706	006364		MOV	#K5,%6		:%6(123456)K5
1471	006646	112625			MOVB	(6)+,(5)+		:LOW .BYTE OF R6 TO R5
1472	006650	022767	050456	177476	CMP	#050456,K1		
1473	006656	001401			BEQ	+.4		
1474	006660	000000			HLT			:FALSE TRANSFER OF .BYTE
1475	006662	010700			SCOPE			
1476								
1477	006664	012767	123456	177472	MOV	#123456,K5		
1478	006672	012767	050505	177454	MOV	#050505,K1		
1479	006700	012705	006354		MOV	#K1,%5		:%5(050505)K1
1480	006704	012706	006366		MOV	#K6,%6		:%6(123456)K5
1481	006710	114625			MOVB	-(6),(5)+		:LOW .BYTE OF R6 TO R5 (DECREMENT)
1482	006712	026727	177436	050456	CMP	K1,#050456		
1483	006720	001401			BEQ	+.4		
1484	006722	000000			HLT			:FALSE R6 .BYTE TRANSFER
1485	006724	010700			SCOPE			
1486								
1487	006726	012767	123456	177420	MOV	#123456,K1		
1488	006734	012767	050505	177422	MOV	#050505,K5		
1489	006742	012705	006354		MOV	#K1,%5		:(123456)
1490	006746	012706	006364		MOV	#K5,%6		:(050505)
1491	006752	112526			MOVB	(5)+,(6)+		:LOW OF R5 TO LOW OF R6
1492	006754	022767	050456	177402	CMP	#050456,K5		
1493	006762	001401			BEQ	+.4		
1494	006764	000000			HLT			:FALSE R6 .BYTE TRANSFER
1495	006766	010700			SCOPE			
1496								
1497	006770	012767	123456	177356	MOV	#123456,K1		
1498	006776	012767	050505	177360	MOV	#050505,K5		
1499	007004	012705	006355		MOV	#K1+1,%5		:123456
1500	007010	012706	006364		MOV	#K5,%6		:050505
1501	007014	112526			MOVB	(5)+,(6)+		:HIGH OF R5 TO LOW OF R6
1502	007016	026727	177342	050647	CMP	K5,#050647		
1503	007024	001401			BEQ	+.4		
1504	007026	000000			HLT			:FALSE R6 .BYTE TRANSFER
1505	007030	010700			SCOPE			
1506								
1507	007032	012767	123456	17734	MOV	#123456,K1		
1508	007040	012767	050505	177316	MOV	#050505,K5		
1509	007046	012705	006355		MOV	#K1+1,%5		:R5-123456=-ODD ADDRESS
1510	007052	012706	006364		MOV	#K5,%6		:R6=050505=-.EVEN ADDRESS
1511	007056	112625			MOVB	(6)+,(5)+		:LOW OF R6 TO HIGH OF R5
1512	007060	022767	042456	177266	CMP	#042456,K1		
1513	007066	001401			BEQ	+.4		
1514	007070	000000			HLT			:FAILED LOW OF 6 TO HIGH OF 5
1515	007072	010700			SCOPE			
1516								
1517								:TEST .BYTE OPERATION WITH SEQUENTIAL ODD;.EVEN ADDRESS
1518	007074	126767	177270	177267	CMPB	K7,K7+1		:SAME .WORD LOW TO HIGH
1519	007102	001401			BEQ	+.4		
1520	007104	000000			HLT			:SHOULD COMPARE LOW TO HIGH
1521	007106	010700			SCOPE			
1522								
1523	007110	126767	177255	177252	CMPB	K7+1,K7		:COMPARE ODD TO .EVEN SAME .WORD
1524	007116	001401			BEQ	.		
1525	007120	000000			HLT			:ODD TO .EVEN .BYTE FAILURE

1526	007122	010700			SCOPE		
1527							
1528	007124	126767	177243	177236	CMPB	K10+1,K7	:SEQUENTIAL .BYTES
1529	007132	001401			BEQ	+.4	:DIFFERENT .WORDS
1530	007134	000000			HLT		:ODD TO .EVEN FAILED
1531	007136	010700			SCOPE		
1532							
1533	007140	126767	177226	177220	CMPB	K10,K6	
1534	007146	001401			BEQ	+.4	
1535	007150	000000			HLT		:.EVEN TO EVEN FAILED
1536	007152	010700			SCOPE		
1537							
1538	007154	126767	177211	177211	CMPB	K7+1,K10+1	
1539	007162	001401			BEQ	+.4	
1540	007164	000000			HLT		:ODD TO ODD FAILED
1541	007166	010700			SCOPE		
1542							
1543	007170	126767	177176	177175	CMPB	K10,K10+1	
1544	007176	001001			BNE	+.4	
1545	007200	000000			HLT		:LOW TO HIGH IN SAME .WORD FAILED
1546	007202	010700			SCOPE		
1547							
1548	007204	126767	177163	177160	CMPB	K10+1,K10	
1549	007212	001001			BNE	+.4	
1550	007214	000000			HLT		:HIGH TO LOW IN SAME .WORD FAILED
1551	007216	010700			SCOPE		
1552							
1553	007220	126767	177146	177143	CMPB	K10,K7+1	
1554	007226	001001			BNE	+.4	
1555	007230	000000			HLT		:.EVEN TO ODD FAILED
1556	007232	010700			SCOPE		
1557							
1558							
1559	007234	012700	006374				:TEST SPECIAL CASE [R,(R)+]
1560	007240	010020			MOV	#K11,%0	:SOURCE AND DESTINATION BOTH R0
1561	007242	026727	177126	006376	MOV	%0,(0)+	:SOURCE NO MEMORY REFERENCE
1562	007250	001402			CMP	K11,#K11+2	:DESTINATION IS MEMORY REFERENCE
1563	007252	000167	000072		BEQ	+.6	
1564	007256	010700			JMP	(CPU05	:FAILED %(0),(0)+
1565					SCOPE		
1566	007260	012700	006374		MOV	#K11,%0	
1567	007264	110020			MOVB	%0,(0)+	
1568	007266	026727	177102	006375	CMP	K11,#K11+1	
1569	007274	001401			BEQ	+.4	
1570	007276	000000			HLT		:FAILED MOVB %0,(0)+
1571	007300	010700			SCOPE		
1572							
1573	007302	012706	006374		MOV	#K11,%6	
1574	007306	110626			MOVB	%6,(6)+	
1575	007310	026727	177060	006376	CMP	K11,#K11+2	
1576	007316	001401			BEQ	+.4	
1577	007320	000000			HLT		:FAILED MOVB %6,(6)+
1578	007322	010700			SCOPE		
1579							
1580	007324	012706	006374		MOV	#^11,%6	
1581	007330	010626			MOV	%6,(6)+	

1582	007332	026727	177036	006376		CMP	K11,#K11+2	
1583	007340	001401				BEQ	.+4	
1584	007342	000000				HLT		;FAILED MOV %6,(6)+
1585	007344	010700				SCOPE		
1586								
1587	007346	000444				BR	STAND	
1588	007350	012700	006374		CPU05:	MOV	#K11,%0	;SOURCE AND DESTINATION BOTH R0
1589	007354	010020				MOV	%0,(0)+	;SOURCE NO MEMORY REFERENCE
1590	007356	026727	177012	006374		CMP	K11,#K11	;DESTINATION IS MEMORY REFERENCE
1591	007364	001401				BEQ	.+4	
1592	007366	000000				HLT		;FAILED %(0),(0)+
1593	007370	010700				SCOPE		
1594								
1595	007372	012700	006374			MOV	#K11,%0	
1596	007376	110020				MOVB	%0,(0)+	
1597	007400	026727	176770	006374		CMP	K11,#K11	
1598	007406	001401				BEQ	.+4	
1599	007410	000000				HLT		;FAILED MOVB %0,(0)+
1600	007412	010700				SCOPE		
1601								
1602	007414	012706	006374			MOV	#K11,%6	
1603	007420	110626				MOVB	%6,(6)+	
1604	007422	026727	176746	006374		CMP	K11,#K11	
1605	007430	001401				BEQ	.+4	
1606	007432	000000				HLT		;FAILED MOVB %6,(6)+
1607	007434	010700				SCOPE		
1608								
1609	007436	012706	006374			MOV	#K11,%6	
1610	007442	010626				MOV	%6,(6)+	
1611	007444	026727	176724	006374		CMP	K11,#K11	
1612	007452	001401				BEQ	.+4	
1613	007454	000000				HLT		;FAILED MOV %6,(6)+
1614	007456	010700				SCOPE		
1615								
1616	007460	000277			STAND:	SCC		;SET STATUS
1617	007462	005067	170310			CLR	STATUS	;CLEAR STATUS
1618	007466	103001				BCC	.+4	
1619	007470	000000				HLT		;C NOT CLEAR
1620	007472	102001				BVC	.+4	
1621	007474	000000				HLT		;V NOT CLEAR
1622	007476	001001				BNE	.+4	
1623	007500	000000				HLT		;Z NOT CLEAR
1624	007502	100001				BPL	.+4	
1625	007504	000000				HLT		;N NOT CLEAR
1626	007506	010700				SCOPE		
1627								
1628	007510	000257				CCC		;CLEAR CONDITION CODES
1629	007512	052767	000017	170256		BIS	#17,STATUS	;SET STATUS TO ONES
1630	007520	103401				BCS	.+4	
1631								
1632	007522	000000				HLT		;C NOT SET
1633	007524	102401				BVS	.+4	
1634	007526	000000				HLT		;V NOT SET
1635	007530	001401				BEQ	.+4	
1636	007532	000000				HLT		;Z NOT SET
1637	007534	100401				BM!	.+4	

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1638 007536 000000          HLT          ;N NOT SET
1639 007540 010700          SCOPE
1640
1641          ;TEST THAT ALL RESERVED INSTRUCTIONS TRAP
1642 007542 012700 010170  GIN1:  MOV    #TABLE,TAB      ;TABLE POINTER
1643 007546 012002          GIN1:  MOV    (TAB)+,FIRST    ;FIRST OR CURRENT INSTRUCTION
1644 007550 012001          GIN1:  MOV    (TAB)+,LAST    ;LAST INSTRUCTION OR GROUP
1645 007552 020267 000446  GIN1:  CMP    FIRST,FINISH   ;TESTED ALL
1646 007556 001413          GIN1:  BEQ    GIN3          ;YES BRANCH
1647 007560 010267 000442  GIN2:  MOV    FIRST,INST     ;SET UP INST
1648 007564 012767 007642 170216 GIN2:  MOV    #RET,10        ;SET UP RETURN FROM TRAP
1649 007572 012706 010340  GIN2:  MOV    #BUFF,LP      ;SET UP LINK POINTER
1650 007576 005067 170174  GIN2:  CLR    CC            ;CLEAR PRIORITY
1651 007602 000167 000420  GIN2:  JMP    INST         ;EXECUTE RESERVED INSTRUCTION
1652 007606 010546          GIN3:  MOV    R5, -(SP)      ;
1653 007610 004537 007716  GIN3:  JSR    R5, @#ENDMSS;MESSAGE ON PASS COMPLETE
1654 007614 012605          GIN3:  MOV    (SP)+,R5      ;
1655 007616 013700 000042  GIN3:  MOV    @#42,%0       ;
1656 007622 001405          GIN3:  BEQ    DOAGN        ;
1657 007624 000005          GIN3:  RESET              ;
1658 007626 004710          $ENDAD: JSR    %7,@%0      ;
1659 007630 000240          GIN3:  NOP                ;
1660 007632 000240          GIN3:  NOP                ;
1661 007634 000240          GIN3:  NOP                ;
1662 007636 000167 170536  DOAGN:  JMP    BEGIN        ;LOOP
1663
1664          ;TRAPPING SHOULD SEND YOU HERE
1665 007642 020627 010334  RET:   CMP    LP,#BUFF-4    ;TEST DECREMENT OF LP
1666 007646 001401          RET:   BEQ    RET1         ;
1667 007650 000000          RET:   HLT                ;WRONG DECREMENT
1668 007652 026727 000456 010230 RET1:  CMP    BUFF-4,#INST+2 ;LOC OF INST UNINCREMENTED
1669 007660 001401          RET1:  BEQ    RET2         ;
1670 007662 000000          RET1:  HLT                ;INST INC ON TRAP
1671 007664 005767 000446  RET2:  TST    BUFF-2        ;
1672 007670 001401          RET2:  BEQ    .+4          ;
1673 007672 000000          RET2:  HLT                ;CONDITION CODES SET ON TRAP
1674 007674 005267 000326  RET2:  INC    INST         ;
1675 007700 005202          RET2:  INC    FIRST        ;
1676 007702 026701 000320  RET2:  CMP    INST,LAST    ;
1677 007706 001717          RET2:  BEQ    GIN1        ;SET UP NEW GROUP
1678 007710 000167 177644  RET2:  JMP    GIN2        ;FINISH OLD GROUP
1679 007714 000000          RET2:  HALT              ;
1680
1681          ;ROUTINE PRINTS TITLE AND END OF PASS MESSAGES
1682 007716 010046          ENDMSS: MOV   R0, -(SP)     ;SAVE R0
1683 007720 012700 010346  ENDMSS: MOV   #HEADER,R0   ;SET POINTER TO TITLE
1684 007724 004537 010142  ENDMSS: JSR   R5, @#HDRPNT ;GO SEE IF YOU DID IT ALREADY
1685 007730 012700 010403  ENDMSS: MOV   #ENDPSS,R0   ;SET POINTER TO MESSAGE
1686 007734 004537 010114  ENDMSS: JSR   R5, @#PRINT  ;GO PRINT
1687 007740 004537 007764  ENDMSS: JSR   R5, @#COUNT ;CALC NO# OF PASS & PRINT
1688 007744 012700 010416  ENDMSS: MOV   #PUNCT, R0   ;SET POINTER TO LF&CR
1689 007750 004537 010114  ENDMSS: JSR   R5, @#PRINT  ;GO PRINT
1690 007754 012600          ENDMSS: MOV   (SP)+, R0    ;RESTORE R0
1691 007756 000005          ENDMSS: RESET           ;PREVENT GARBAGE ON TTY
1692 007760 000205          ENDMSS: RTS    R0        ;GO HOME
1693 007762 000000          ENDMSS: HALT           ;

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1694
1695
1696 007764 010046
1697 007766 010146
1698 007770 005037 010342
1699 007774 005237 010344
1700 010000 013700 010344
1701 010004 012701 000060
1702 010010 006200
1703 010012 103003
1704 010014 062701 000001
1705 010020 000241
1706 010022 006200
1707 010024 103003
1708 010026 062701 000002
1709 010032 000241
1710 010034 006200
1711 010036 103003
1712 010040 062701 000004
1713 010044 000241
1714 010046 010146
1715 010050 005237 010342
1716 010054 005700
1717 010056 001352
1718 010060 105737 177564
1719 010064 100375
1720 010066 012637 177566
1721 010072 005337 010342
1722 010076 005737 010342
1723 010102 001366
1724 010104 012601
1725 010106 012600
1726 010110 000205
1727 010112 000000
1728
1729
1730 010114 105737 177564
1731 010120 100375
1732 010122 105710
1733 010124 001001
1734 010126 000205
1735 010130 112037 177566
1736 010134 000167 177754
1737 010140 000000
1738
1739
1740 010142 005737 010344
1741 010146 001006
1742 010150 023727 000042 007626
1743 010156 001402
1744 010160 004567 177730
1745 010164 000205
1746 010166 000000
1747
1748 010170 000006
1749 010172 000077

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:ROUTINE COUNTS PASSES MADE AND PRINTS THE NO#
COUNT: MOV R0, -(SP) ;SAVE CONTENTS R0,
MOV R1, -(SP) ;AND R1
CLR @#STKNT ;INIT STACK COUNTER
INC @#PSSCNT ;INC PASSCOUNTER
MOV @#PSSCNT,R0 ;SAVE NEW PASSCOUNT
1$: MOV #60, R1 ;NOW BUILD ASCII NO# IN R1
ASR R0 ;SHIFT BIT INTO CARRY
BCC 2$ ;EXAMINE CARRY BIT
ADD #1, R1 ;ADD VALUE TO R1 IF C SET
CLC ;THEN CLEAR CARRY
2$: ASR R0 ;REPEAT FOR SECOND BIT
BCC 3$
ADD #2, R1
CLC
3$: ASR R0 ;REPEAT FOR THIRD BIT
BCC 4$
ADD #4, R1
CLC
4$: MOV R1, -(SP) ;PUSH OCTAL ASCII ON STACK
INC @#STKNT ;AND COUNT IT
TST R0 ;EXAMINE R0 FOR MORE BITS
BNE 1$ ;REPEAT CONVERSION UNTIL R0=0
5$: TSTB @#TTCSR ;THEN PRINT NUMBER IN STACK
BPL 5$ ;WAIT FOR TTY
MOV (SP)+, @#TTBUF ;SEND FIRST OCTAL ASCII
DEC @#STKNT ;AND UNCOUNT IT
TST @#STKNT ;ANY MORE LEFT?
BNE 5$ ;IF SO, DO IT AGAIN
MOV (SP)+, R1 ;NOW RESTORE R1
MOV (SP)+, R0 ;AND R0
RTS R5 ;AND GO HOME
HALT

:ROUTINE TO PRINT ASCII MESSAGE, R0 MUST=ADR OF MESSAGE
PRINT: TSTB @#TTCSR ;CHECK TTY STATUS
BPL PRINT ;WAIT UNTIL READY
TSTB (R0) ;CHECK BYTE TO BE SENT
BNE NULL ;BR IF NOT A NULL BYTE
RTS R5 ;IF NULL THEN GO HOME
NULL: MOVB (R0)+, @#TTBUF ;SEND BYTE TO TTY BUFFER
JMP PRINT ;REPEAT UNTIL DONE
HALT

:ROUTINE TO PRINT TITLE, PASSCOUNT MUST=0 TO PRINT
HDRPNT: TST @#PSSCNT ;IS THIS 1ST PASS?
BNE ENDS ;IF NOT, THEN NO TITLE
CMP @#42, #SENDAD ;ACT11-QV OR AUTO-ACCEPT MODE?
BEQ ENDS ;IF SO, THEN NO TITLE
JSR R5, PRINT ;PASSCOUNT=0, GO PRINT TITLE
END$: RTS R5 ;NOW GO HOME
HALT

*BLE: 6 ;END OF INSTRUCTION GROUP
?? ;END OF OPERATE

```

```
1750 010174 000210          210          ;RTS,RT1,JMP
1751 010176 000237          240-1
1752 010200 006400          6400
1753 010202 007777          7777
1754 010204 070000          70000
1755 010206 077777          77777
1756 010210 106400          106400
1757 010212 106777          106777
1758 010214 107000          107000
1759 010216 107777          107777
1760 010220 170000          170000
1761 010222 177777          177777
1762 010224 010224          FINISH: .          ;END FLAG
1763 010226 000000          INST:  HALT        ;WILL CONTAIN RESERVED INST
1764 010230 000000          HALT        ;SHOULD TRAP TO LOC 10
1765 010232 000000          HALT        ;LOC 10 SHOULD SEND YOU TO
1766 010234 000000          HALT        ;RET
1767 010236 000000          HALT
1768          010340          .+100
1769 010340 000000          BUFF:  0
1770 010342 000000          STKNT: 0
1771 010344 000000          PSSCNT: 0
1772 010346 005015 055103 040513  HEADER: .ASCIZ<15><12>/CZKARBO TST 14 TRAPS TST/<15><12>
1773 010354 041122 020060 051524
1774 010362 020124 032061 052040
1775 010370 040522 051520 052040
1776 010376 052123 005015 000
1777 010403 015 04705 020104  ENDPSS: .ASCIZ<15>/END PASS /
1778 010410 040520 051523 000040
1779 010416 005015 077407 000  PUNCT: .ASCIZ<15><12><7><17>
1780          010424          .EVEN
1781          0000C1          .END
```


RETD3	002056	626	630#											
RETD4	002474	724	728#											
RETD5	003046	815	819#											
RETE	000564	373	377#											
RETE1	001134	458	461#											
RETE2	001546	552	556#											
RETE3	002116	635	639#											
RETE4	002534	733	737#											
RETE5	003106	824	828#											
RETF	000620	384	387#											
RETF1	001166	467	470#											
RETF2	001602	563	566#											
RETF3	002152	646	649#											
RETF4	002570	744	747#											
RETF5	003142	835	838#											
RETG	000676	400	403#											
RETG1	001244	483	486#											
RETG2	001660	579	582#											
RETG3	002230	662	666#											
RETG4	002646	760	763#											
RETG5	003220	851	854#											
RETH5	003274	870	873#											
RETJ	003312	877	879#											
RETK	003340	886	888#											
RETL	003400	896	900#											
RETM	003440	905	909#											
RETN	003474	916	919#											
RETO	003550	932	935#											
RETP	003630	952	955#											
RETQ	003650	959	961#											
RETR	003700	968	970#											
RETS	003742	978	982#											
RETT	004004	987	991#											
RETU	004042	998	1001#											
RETV	004122	1014	1017#											
RET1	007652	1666	1668#											
RET2	007664	1669	1671#											
RTRAP =	000010	288#	338*	345*	354*	364*	373*	384*	385*	400*	401*			
RTRAP1=	000034	280#	423*	430*	439*	449*	458*	467*	468*	483*	484*			
RTRAP2=	000020	279#	517*	524*	533*	543*	552*	563*	564*	579*	580*			
RTRAP3=	000030	278#	602*	609*	616*	626*	635*	646*	647*	662*	663*			
RTRAP4=	000014	277#	698*	705*	714*	724*	733*	744*	745*	760*	761*	1034*	1042*	1051*
RTRAP5=	000004	276#	789*	796*	805*	815*	824*	835*	836*	851*	852*	870*	877*	886*
		896*	905*	916*	917*	932*	933*	952*	959*	968*	978*	987*	998*	999*
		1014*	1015*	1159*	1164*									
R6TST	006400	1385	1398#											
R7TRX	005156	1160	1165	1171#										
R7TR1	005202	1173	1177#											
R7TR2	005236	1183	1187#											
R7TR2A	005232	1185#	1187											
R7TR3	005270	1192	1195#											
R7TR4	005326	1201	1206#											
SCOPE	010700	272#	336	341	350	359	362	371	380	398	416	421	426	435
		444	447	456	481	499	510	515	520	529	538	541	550	559
		577	595	600	605	621	624	633	642	660	679	682	691	696
		701	710	719	722	731	740	758	776	787	792	801	810	813

CZKARBO TST 14 TRAPS TST MACY11 30A(1052) 25-SEP-78 10:03 ^{N 3} PAGE 41
CZKARB.P11 25-SEP-78 10:01 CROSS REFERENCE TABLE -- MACRO NAMES

SEQ 0039

VTRP 1104# 1116 1117 1118 1119 1120 1121 1125

. ABS. 010424 000

ERRORS DETECTED: 0

CZKARB.BIN,CZKARB.LST/CRF/SOL-CZKARB.P11
RUN-TIME: 1 3 .6 SECONDS
RUN-TIME RATIO: 309/6=46.5
CORE USED: 7K (13 PAGES)