

Micro Fiche Scan

Name of device(s) tested:

PDP-11

Test description:

POWER FAIL DIAG

MAINDEC Number or Package Identifier (after SEP 1977):

CZKAQH0

Fiche Document Part Number:

AH-8815H-MC

Fiche preparation date unknown, using copyright year:

1985

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IDENTIFICATION

PRODUCT CODE: AC-8814H-MC
PRODUCT NAME: CZKAQHO POWER FAIL DIAG
DATE RELEASED: JULY 1985
MAINTAINER: DIAGNOSTIC ENGINEERING

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1. ABSTRACT

THE PDP-11 POWER FAIL DIAGNOSTIC CONSIST OF TWO PARTS, ONE OF WHICH IS A EXERCISER TEST WHICH CHECK ALL FACETS OF POWER FAIL. (REF SEC. 5.2) OPERATOR INTERVENTION IS REQUIRED.

PART TWO IS MADE UP OF SEVERAL SMALL TESTS WHICH ENABLE THE USER TO TROUBLE-SHOOT THE POWER FAIL MODULE WITH SMALL BASIC ROUTINES. (REF. SEC. 5.2)

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11
(MACHINE MAY HAVE UP TO 28K OF MEMORY)

2.2 STORAGE

2.2.1 THE MAIN BODY OF THE PROGRAM OCCUPIES FROM LOCATION 0 TO 4750

2.2.2 THE POWER FAIL EXERCISER USES ALL OF MEMORY UP TO THE LOADERS, FOR A MEMORY VOLATILITY TEST

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

*****NOTE***** WHEN RUNNING THIS DIAGNOSTIC THE TERMINAL SHOULD BE POWERED FROM AN UNSWITCHED POWER OUTLET (NOT CONTROLLED BY PROCESSOR ON/OFF SWITCH). POWER FAIL TYPE OUT MESSAGE MAY NOT BE TYPED IF TERMINAL IS NOT POWERED BY AN UNSWITCHED POWER OUTLET.

4.1 SWITCH SETTING

WHEN THE EXERCISER TEST OR A DIAGNOSTIC TEST IS STARTED, THE PROGRAM WILL DETERMINE IF THE PROCESSOR HAS A HARDWARE SWITCH REGISTER (SWR). IF THERE IS NO HARDWARE SWR, THE PROGRAM WILL USE THE SOFTWARE SWR LOCATED AT ADDRESS 176. THE OPERATOR SHOULD SET UP LOC 176 BEFORE STARTING THE PROGRAM WITH THE

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APPROPRIATE VALUE.

SWITCH	FUNCTION
15	SET-HALT AT END OF TEST PASS CLEARED-LOOP ON TEST
14	SET-DISABLE TTY PRINTING CLEARED-ENABLE TTY PRINTING

NOTE1: THE EXERCISER AND DIAGNOSTIC TESTS WILL ALWAYS HALT ON ERROR.

NOTE2: SINCE THE HARDWARE SWR MAY BE CLEARED ON POWER-UP, THE PROGRAM DOES NOT REFERENCE THE HARDWARE SWR DURING LOOP ON TEST. THEREFORE, TO CHANGE THE SWITCH SETTINGS USING THE HARDWARE SWR THE OPERATOR MUST RE-START A TEST.

THE OPERATOR MAY CHANGE THE SWITCH SETTINGS FROM THE TTY. AFTER STARTING A TEST, THE PROGRAM WILL OUTPUT AT THE TTY (IF SR14 IS CLEARED) THE FOLLOWING MESSAGE

SWR=XXXXXX

NEW SWR=

THE OPERATOR MAY THEN ENTER UP TO SIX OCTAL DIGITS. ENTERING MORE THAN SIX DIGITS OR A CHARACTER OTHER THAN A DIGIT RESULTS IN A REPEAT OF THE PROMPTING MESSAGE. CARRIAGE RETURN ENTERS THE UPDATED VALUE. IF NO DIGITS HAVE BEEN ENTERED, THE SWITCH REGISTER VALUE REMAINS UNCHANGED.

THE OPERATOR MAY INTERRUPT THE EXERCISER TEST TO CHANGE THE SWITCH SETTINGS BY TYPING CONTROL-G AT THE TTY. THE PROGRAM WILL OUTPUT AT THE TTY THE FOLLOWING MESSAGE

SWR=XXXXXX

NEW SWR=

THE OPERATOR MAY THEN RESPOND AS DESCRIBED IN THE PRECEDING PARAGRAPH.

NOTE3: THE PROGRAM WILL RESPOND TO CONTROL-G ONLY DURING THE EXERCISER TEST, NOT DURING THE DIAGNOSTIC TESTS.

4.2 STARTING ADDRESS OR ADDRESSES

BEFORE STARTING THE OPERATOR SHOULD REFERENCE THE PROGRAM LISTING FOR OPERATOR INSTRUCTIONS FOR EACH TEST.

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4.2.1 EXERCISER TEST

THE STARTING ADDRESS OF THE POWERFAIL EXERCISER IS LOC.200.
THE EXERCISER TEST IS CALLED TEST 5.

4.2.2 DIAGNOSTIC TESTS

LOC. 204 IS THE STARTING ADDRESS FOR TESTING THE POWER FAIL TRAP CAPABILITY
LOC. 210 IS THE STARTING ADDRESS FOR TESTING POWER FAIL RE-START CAPABILITY (USI
LOC. 214 IS THE STARTING ADDRESS FOR TESTING POWER FAIL RE-START CAPABILITY (C
LOC. 220 IS THE STARTING ADDRESS FOR TESTING POWER FAIL RE-START CAPABILITY (USI
LOC 224 IS THE STARTING ADDRESS FOR TESTING 2MILLI SEC. SHUT DOWN CAPABILITY OF
LOC. 230 IS THE STARTING ADDRESS FOR TESTING 2 MILLI SEC. UP TIME OF POWER FAIL.
THESE SIX TESTS ARE REFERRED TO AS TEST1, TEST2, ALTEST,
ALTST1, TEST3, AND TEST4 RESPECTIVELY.

4.3 PROGRAM AND/OR OPERATOR ACTION

THE PROGRAM TITLE IS PRINTED EACH TIME THE EXER-
CISER TEST IS STARTED. AN END-OF-PASS STATEMENT
IS PRINTED AT THE END OF EACH TEST LOOP. A POWER FAIL
MESSAGE IS PRINTED AFTER THE POWER OFF-ON SEQUENCE OF
THE EXERCISER TEST.

THE OPERATOR HAS A LARGE PART IN THIS TEST. IT IS HIS RESPONSI-
ABILITY TO GENERATE A POWER FAIL CONDITION.
TO CAUSE A VALID POWER FAILURE ON A SYSTEM, REMOVE THE AC
FROM THE POWER CONTROL PANEL BY EITHER TRIPPING THE AC
BREAKER ON THE POWER BUS BOX, OR BY PULLING THE WALL PLUG,
WHICHEVER IS APPROPRIATE. IN HOUSE, A POWER INTERRUPTER
MAY ALSO BE USED.

NOTE1: INTERRUPTING POWER BY USING THE FRONT PANEL KEY OR
THE BREAKER SWITCH ON A POWER SUPPLY IS NOT VALID. THIS
METHOD DEFEATS THE ACTION OF THE LINE FILTER OF THE POWER
CONTROL AND THUS CAN ALLOW NOISE FROM SWITCHING TRANSIENTS
TO ENTER THE SYSTEM.
REFER TO M.A.S.T. FOR MORE INFORMATION ON POWER
FAIL PROCEDURES.

NOTE2: DO NOT INTERRUPT THE POWER DURING TITLE
PRINT-OUT, WHILE CHANGING THE SWITCH SETTINGS FROM
THE TTY, OR DURING THE END-OF-PASS PRINT-OUT OF A DIAG-
NOSTIC TEST. THE POWER MAY BE INTERRUPTED DURING THE
END-OF-PASS PRINT-OUT OF THE EXERCISER TEST.

NOTE3: IF THE POWER IS INTERRUPTED DURING THE END-

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OF PASS PRINT-OUT OF THE EXERCISER TEST, THE POWER FAIL AND POWER RESTORE ROUTINES WILL BRANCH AROUND THE CODE THAT NORMALLY CHECKS THE STACK FOR A PROPER VALUE. THE POWER FAIL AND POWER RESTORE ROUTINES WILL ALWAYS BE FULLY EXECUTED WHEN TTY PRINTING IS DISABLED (SR14 SET).

5. ROUTINE ABSTRACTS

5.1 MASTER EXERCISER TEST

THIS ROUTINE INCORPORATES A MEMORY VOLATILITY TEST WHILE WAITING FOR A POWER FAILURE. THE ROUTINE FIRST DETERMINES THE AMOUNT OF MEMORY ON THE SYSTEM AND THEN FILLS THAT MEMORY WITH A 152525 PATTERN. THE ROUTINE THEN CHECKS MEMORY FOR THE CORRECT DATA. IF A POWER FAILURE OCCURS THE ROUTINE WILL STORE ALL OF THE ACTIVE REGISTERS AND WAIT FOR 2 MILLISECONDS AND HALT. THE ROUTINE ON RESTART RESTORES THE ACTIVE REGISTERS AND WAITS TO SEE THAT NO OTHER POWER FAILURE OCCURS WITHIN A 2 MILLISECOND PERIOD. WHEN THE ROUTINE EXITS FROM THE RESTORE IT GOES BACK TO CHECKING MEMORY.

5.2 DIAGNOSTIC SUBROUTINE ABSTRACTS

POWER FAIL TRAP CAPABILITY

IN THIS TEST THE ABILITY OF THE POWER FAIL TO TRAP TO LOCATION 24 ON POWER DOWN AND POWER UP IS TESTED THE STACK IS CHECKED FOR THE CORRECT VALUE AND THE STACK POINTER IS TESTED FOR THE CORRECT CONTENTS.

A HALT OCCURS WHEN POWER IS RESTORED, THE OPERATOR MUST DEPRESS CONTINUE TO COMPLETE TEST.

POWER FAIL RE-START CAPABILITY (WAIT)

IN THIS ROUTINE THE ABILITY OF THE POWER FAIL TO TRAP AND STORE ACTIVE REGISTERS AND RESTART CORRECTLY USING A WAIT INSTRUCTION TO WAIT FOR POWER FAILURE IS TESTED HERE

POWER FAIL RE-START CAPABILITY (BR.)

IN THIS ROUTINE THE ABILITY OF THE POWER FAIL TO TRAP AND STORE ACTIVE REGISTERS, AND RESTART CORRECTLY USING A BR, TO WAIT FOR POWER FAILURE IS TESTED HERE.

POWER FAIL RE-START CAPABILITY (EMT)

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IN THIS ROUTINE THE ABILITY OF THE POWER FAIL TO TRAP AND STORE ACTIVE REGISTERS, AND RESTART CORRECTLY USING A EMT TO WAIT FOR THE POWER FAILURE IS TESTED HERE

TEST 2 MILLISECONDS DOWN TIME

IN THIS TEST THE AMOUNT OF TIME THE PROCESSOR HAS TO STORE THE ACTIVE REGISTERS IS CHECKED THIS TIME SHOULD EQUAL 2 MILLISECONDS BEFORE ALL PROCESSOR ACTION MUST BE STOPPED.

TEST 2 MILLISECONDS UP TIME

IN THIS TEST THE POWER FAIL LOCK OUT OF 2 MILLISECONDS DURING RE-START IS CHECKED. DURING RESTORE FOR 2 MILLISECONDS THE PROCESSOR WILL NOT ALLOW A POWER FAIL TRAP TO OCCUR

6. ERROR

6.1 ERROR HALTS AND DESCRIPTION

REFER TO LISTING FOR ALL HALTS AND DESCRIPTIONS

6.2 ERROR RECOVERY

IN THE EXERCISER MEMORY VOLATILITY TEST THERE ARE TWO RECOVERABLE HALTS.

HALT NO.1. DATA LIGHTS CONTAIN BAD MEMORY LOCATION (DEPRESS CONTINUE TO TEST SEE DATA)

HALT NO.2. DATA LIGHTS CONTAIN DATA OF BAD MEMORY LOCATION (DEPRESS CONTINUE TO TEST NEXT WORD)

7. RESTRICTIONS

NONE

8. MISCELLANEOUS

8.1 EXECUTION TIME

EACH EXERCISER PASS TAKES APPROXIMATELY 5 SECONDS.

8.2 ACT11 OPERATION

THIS PROGRAM WILL RUN UNDER ACT11.
 **NOTE: IN QUICK VERIFY MODE THE PROGRAM WILL RUN

BUT DOES NOT CHECK ANY OF THE POWERFAIL CIRCUITRY
BECAUSE ACT WILL NOT POWER FAIL DURING QV.

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;PDP-11 POWER FAIL TEST
;THIS PROGRAM CONSIST OF SEVERAL TEST THAT INSURE THAT
;POWER FAIL IS OPERATING CORRECTLY.
;
;
;***PROGRAM SUPPORTS SOFTWARE SWITCH REGISTER [LOC. 176]***

;POWER FAIL TRAPS TO LOCATION 24

.ABS
=0
:REPT 5
. +2
HALT ;POWER FAIL TRAPPED TO WRONG LOCATION
.ENDR ;ADDRESS OF POWER FAIL HANDLER
PFHAND: 0 ;STATUS
0
.REPT 72
. +2
HALT ;POWER FAIL TRAPPED TO WRONG LOCATION
.ENDR

;400 TO 1000 IN MEMORY IS ASSIGNED TO THE STACK

. =46
LOGICAL
. =52
140000
. =176
SWREG: 0 ;SOFTWARE SWITCH REGISTER
. =200
MASTER: JMP TESTS ;COMPLETE TEST OF POWER FAIL


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381 000204 000167 000570      START1: JMP      TEST1      ;ENTER TEST 1 (TEST TRAP CAPABILITY)
382 000210 000167 000676      START2: JMP      TEST2      ;ENTER TEST2 (TEST RE-START CAPABILITY)
383 000214 000167 001166      STR2A: JMP      ALTEST     ;TEST RE-START USING BR. INSTRUCTION
384 000220 000167 001342      STR2B: JMP      ALTST1     ;TEST RE-START USING EMT INSTRUCTION
385 000224 000167 001606      START3: JMP      TEST3     ;ENTER TEST3 (TEST FOR 2 MILLISECONDS TIME) DOWN TIME
386 000230 000167 002136      START4: JMP      TEST4     ;ENTER TEST4 (TEST FOR TWO MILLISECONDS) UP TIME
387          000006          SP=#6          ;STACK
388          000000          LIGHTS=#0     ;DATA LIGHTS
389          177776          STATUS=177776 ;LOCATION OF STATUS REGISTER
390          000007          PC=#7          ;LOCATION OF PC
391          000030          EMTRP=30      ;EMULATOR TRAP LOCATION
392          000007          MFPT=000007
393          000234          SWRG=.
394 000234          177570          .WORD      177570
395          0C1000          .-1000
396
397          ;BASIC POWER FAIL TEST
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399          ;TEST1 IS A ROUTINE USED TO THE POWER FAIL'S ABILITY
400          ;TO TRAP TO LOCATION 24.
401
402          ;OPERATOR INSTRUCTIONS
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405 001000 012706 001000      TEST1:  MOV      #1000, SP   ;SET UP STACK
406 001004 004767 003056          JSR      PC,   SETSWR     ;SET UP SWR POINTER
407 001010 004767 003174          JSR      PC,   UPDATE    ;UPDATE SWR
408 001014 012706 001000      LPTST1: MOV     #1000,SP    ;SET UP STACK
409 001020 012767 001036 176776  MOV     #TEST1H,PFHAND    ;SET UP POINTER
410 001026 052767 000357 176742  BIS     #357,STATUS      ;SET STATUS BITS
411 001034 000001          WAIT          ;WAIT FOR POWER FAIL OPERATOR SHOULD TURN OFF HERE
412 001036 000000          TEST1H: HALT        ;POWER FAIL HALTS HERE ON WAY DOWN
413
414          ;TEST1 CHECK - CHECK IF STACK WAS DECREMENTED AND
415          ;STATUS WAS SET UP.
416 001040 026727 177730 001036      TEST1CH: CMP     774,#TEST1H ;CHECK PC AND SP (LOCATION)
417 001046 001401          BEQ     .+4          ;ARE THEY EQUAL
418 001050 000000          HALT1:  HALT        ;ERROR! PROCESSOR FAILED TO TRAP
419
420          ;LOCATION 774 SHOULD CONTAIN #TEST1H IN STACK
421 001052 026727 177720 000357          CMP     776,#357      ;WAS THE STATUS STORED CORRECTLY
422 001060 001401          BEQ     .+4          ;TEST
423 001062 000000          HALT2:  HALT        ;ERROR THE STATUS BEFORE THE TRAP WAS NOT STORED
424 001064 012700 000210          MOV     #START2,LIGHTS ;SET UP LIGHTS WITH ADDRESS
425 001070 012706 001000          MOV     #1000, SP     ;SET UP STACK
426 001074 004767 003042          JSR      PC,   PRINT    ;END-OF-PASS MSG
427 001100 004726          MSG3
428 001102 005767 177070          TST     SWREG        ;LOOP ON TEST?
429 001106 002342          BGE     LPTST1       ;YES
430 001110 000000          HALT          ;NORMAL HALT NO ERRORS
431
432          ;TEST ROUTINE TO CHECK RE-START CAPABILITY
433          ;USING THE WAIT INSTRUCTION
434          ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
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437 001112 012706 001000      TEST2:  MOV    #1000, SP      ;SET UP STACK
438 001116 004767 002744      JSR     PC,    SETSWR     ;SET UP SWR POINTER
439 001122 004767 003062      JSR     PC,    UPDATE    ;UPDATE SWR
440 001126 012767 000357 176642 LPTST2: MOV    #357,STATUS   ;SET UP CONDITION CODES
441 001134 012767 000005 176664 MOV    #5,PFHAND+2     ;SET UP POWER FAIL CODES
442 001142 012767 001212 176654 MOV    #TEST2A,PFHAND  ;SET UP POINTER TO STORE ROUTINE
443 001150 012706 001000      MOV    #1000,SP       ;SP UP STACK POINTER
444 001154 012700 152525      MOV    #152525,#0     ;SET UP FAST MEMORY
445 001160 010001              MOV    #0,#1
446 001162 010102              MOV    #1,#2
447 001164 010203              MOV    #2,#3
448 001166 010304              MOV    #3,#4
449 001170 010405              MOV    #4,#5
450 001172 000001              WAIT
451 001174 004767 002742      JSR     PC,    PRINT     ;WAIT FOR POWER FAIL TRAP
452 001200 004754              MSG4
453 001202 005767 176770      TST    SWREG          ;LOOP ON TEST?
454 001206 002347              BGE    LPTST2         ;YES
455 001210 C00000              HALT
456
457      ;OPERATOR MUST TURN POWER OFF HERE
458      ;ROUTINE TO STORE ACTIVE REG.
458 001212 022706 000774      TEST2A: CMP    #774,SP      ;IS STACK CORRECT
459 001216 001406              BEQ
460 001220 010667 002600      MOV    SP,SAVE        ;CONTENTS OF STACK SAVED.
461 001224 012767 001232 176572 MOV    #HALT3E,PFHAND ;STACK CONTAINS WRONG ADDR
462 001232 000000              HALT3E: HALT
463 001234 010046              TEST2B: MOV    #0,-(SP)   ;STORE REG 0
464 001236 010146              MOV    #1,-(SP)   ;STORE REG 1
465 001240 010246              MOV    #2,-(SP)   ;STORE REG 2
466 001242 010346              MOV    #3,-(SP)   ;STORE REG 3
467 001244 010446              MOV    #4,-(SP)   ;STORE REG 4
468 001246 010546              MOV    #5,-(SP)   ;STORE REG RE STACK
469 001250 022706 000760      CMP    #760,SP       ;IS STACK CORRECT
470 001254 001404              BEQ
471 001256 012767 001264 176540 MOV    #HALT4E,PFHAND ;THE STACK IS WRONG
472 001264 000000              HALT4E: HALT ;WAIT FOR RESTART
473 001266 012767 001310 176530 TEST2D: MOV    #TEST2CH,PFHAND ;SET UP NEW POINTER
474 001274 012767 000005 176524 MOV    #5,PFHAND+2
475 001302 010667 002516      MOV    SP,SAVE
476 001306 000000              HALT
477
478      ;OPERATOR MUST TURN POWER ON HERE
479      ;ROUTINE TO RE-STORE ACTIVE REGISTER AFTER RE-START.
480
481
482 001310 016706 002510      TEST2CH: MOV    SAVE,SP
483 001314 022726 152525      CMP    #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMORY
484 001320 001401              BEQ    .+4          ;TEST FAST MEMORY #5
485 001322 000000              HALT5E: HALT       ;SAVE REG IN ERROR
486 001324 022726 152525      CMP    #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMORY
487 001330 001401              BEQ    .+4          ;TEST FAST MEMORY #4
488 001332 000000              HALT6E: HALT       ;SAVE REG IN ERROR
489 001334 022726 152525      CMP    #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMORY
490 001340 001401              BEQ    .+4          ;TEST FAST MEMORY #3
491 001342 000000              HALT7E: HALT       ;SAVE REG IN ERROR
492 001344 022726 152525      CMP    #152525,(SP)+ ;TEST SAVE REG. FOR FAST MEMORY

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493 001350 001401          BEQ      .+4          ;TEST FAST MEMORY #2
494 001352 000000          HALT8E: HALT          ;SAVE REG IN ERROR
495 001354 022726 152525  CMP      #152525.(SP)+ ;TEST SAVE REG. FOR FAST MEMORY
496 001360 001401          BEQ      .+4          ;TEST FAST MEMORY #1
497 001362 000000          HALT9E: HALT          ;SAVE REG IN ERROR
498 001364 022726 152525  CMP      #152525.(SP)+ ;TEST FAST MEMORY #0
499 001370 001401          BEQ      .+4
500 001372 000000          HALT10E: HALT         ;SAVE REG. IN ERROR
501 001374 022706 000774  CMP      #774.SP        ;TEST STACK FOR CORRECT ADDR.
502 001400 001401          BEQ      .+4          ;STACK SHOULD HAVE 2 WORDS.
503 001402 000000          HALT11E: HALT         ;STACK HAS WRONG ADDR.
504 001404 000002          RTI          ;RETURN FROM TRAP
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506 ;
507 ;TEST ROUTINE TO CHECK RE-START CAPABILITY
508 ;USING THE BR. INSTRUCTION
509 ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
510 001406 012706 001000  ALTEST: MOV      #1000, SP ;SET UP STACK
511 001412 C04767 002450  JSR      PC, SETSWR ;SET UP SWR POINTER
512 001416 004767 002566  JSR      PC, UPDATE ;UPDATE SWR
513 001422 012767 000357 176346 LPALT: MOV      #357,STATUS ;SET UP CONDITION CODES
514 001430 012767 000005 176370  MOV      #5,PFHAND+2 ;SET UP POWER FAIL CODES
515 001436 012767 001470 176360  MOV      #ALT2,PFHAND ;SET UP POWER DOWN POINTER
516 001444 012706 001000  MOV      #1000.SP ;SET UP STACK
517 001450 000777          REALST: BR        ;WAIT FOR POWER FAIL
518 001452 004767 002464  JSR      PC, PRINT ;END-OF-PASS MSG
519 001456 005002          MSG5
520 001460 005767 176512  TST      SWREG
521 001464 002356          BGE     LPALT
522 001466 000000          HALT
523
524 ;
525 ;STORE ROUTINE FOR ALTEST
526 001470 022706 000774  ALT2:  CMP      #774.SP ;HAS STACK BEEN PUSHED TWICE
527 001474 001406          BEQ     ALT2A ;YES STACK CORRECT
528 001476 010667 002322  MOV      SP,SAVE ;SAVE STACK TO INTERGATE
529 001502 012767 001510 176314  MOV      #ALT2X,PFHAND ;SET UP ERROR POINTER
530 001510 000000          ALT2X: HALT         ;STACK WAS PUSHED >2<
531 001512 022767 001450 177254  ALT2A: CMP      #REALST,774 ;DOES STACK CONTAIN CORRECT ADDRESS
532 001520 001404          BEQ     ALT2B ;STACK CONTAIN LOC BR.
533 001522 012767 001530 176274  MOV      #ALT2AX,PFHAND
534 001530 000000          ALT2AX: HALT        ;LOCATION 774 INCORRECT
535 001532 010667 002266  ALT2B: MOV      SP,SAVE ;SAVE STACK
536 001536 012767 001554 176260  MOV      #ALT2C,PFHAND ;SET UP RESTART POINTER
537 001544 012767 000005 176254  MOV      #5,PFHAND+2
538 001552 000000          HALT
539 001554 016706 002244  ALT2C: MOV      SAVE,SP ;END OF STORE ROUTINE
540 001560 062716 0J0002  ADD      #2,(SP) ;RE-SET STACK
541 001564 000002          RTI          ;SET NEW RETURN ADDRESS
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551      ; TEST ROUTINE TO CHECK RESTART CAPABILITY
552      ; USING THE EMULATOR TRAP FOR A WAIT
553      ; OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
554      ;
555      ;
556      001566 012706 001000      ALTST1: MOV      #1000, SP      ;SET UP STACK
557      001572 004767 002270      JSR      PC,      SETSWR     ;SET UP SWR POINTER
558      001576 004767 002406      JSR      PC,      UPDATE    ;UPDATE SWR
559      001602 012767 000357 176166 LPALT1: MOV #357, STATUS ;SET UP CONDITION CODES
560      001610 012767 000005 176210      MOV      #5,PFHAND+2      ;SET UP POWER FAIL CODES
561      001616 012767 001674 176200      MOV      #ALT3A,PFHAND    ;SET UP POWER DOWN POINTER
562      001624 012706 001000      MOV      #1000,SP
563      001630 012767 004016 176172      MOV      #LRTI,EMTRP     ;SET UP EMT TRAP
564      001636 012767 000005 176166      MOV      #5,EMTRP+2
565      001644 104002      EMTWT: EMT      +2      ;EMULATOR TRAP
566      001646 000776      BR      -2
567      001650 C16767 002166 176152 ALTST2: MOV      SAVE7,EMTRP
568      001656 004767 002260      JSR      PC,      PRINT    ;END-OF-PASS MSG
569      001662 005031      MSG6
570      001664 005767 176306      TST      SWREG           ;LOOP ON TEST?
571      001670 002344      BGE      LPALT1         ;YES
572      001672 000000      HALT      ;NORMAL HALT NO ERRORS
573
574      ; ROUTINE TO STORE ACTIVE REGISTERS
575      ; POWER DOWN
576      ;
577      001674 016767 176130 002140 ALT3A: MOV      EMTRP,SAVE7    ;SAVE EMULATOR TRAP
578      001702 012767 002034 176120      MOV      #ALT3X,EMTRP    ;SET UP ERROR HALT
579      001710 022706 000774      CMP      #774,SP         ;HAS STACK BEEN PUSHED TWICE
580      001714 001414      BEQ      ALT3C
581      001716 022706 000770      CMP      #770,SP         ;HAS STACK BEEN PUSHED 4 TIMES
582      001722 001411      BEQ      ALT3C
583      001724 012767 001744 176072 ALT3B: MOV      #ALT3BX,PFHAND ;SET UP POWER FAIL POINTER
584      001732 012767 000005 176066      MOV      #5,PFHAND+2
585      001740 010667 002060      MOV      SP,SAVE        ;SAVE STACK
586      001744 000000      ALT3BX: HALT      ;STACK INCORRECT (STACK PUSHED LESS THAN 2 OR MORE THAN
587      001746 012767 001770 176050 ALT3C: MOV      #ALT3D,PFHAND ;SET UP RE-START POINTER
588      001754 012767 000005 176044      MOV      #5,PFHAND+2    ;SET UP NEW STATUS
589      001762 010667 002036      MOV      SP,SAVE
590      001766 000000      HALT      ;END OF STORE ROUTINE
591      ; ROUTINE TO TEST POWER UP SEQUENCE
592      ;
593      ;
594      001770 016706 002030      ALT3D: MOV      SAVE,SP      ;RESTORE STACK
595      001774 022706 000774      CMP      #774,SP         ;WAS STACK PUSHED ONLY TWICE
596      002000 001723      BEQ      ALTST2
597      002002 022706 000770      CMP      #770,SP         ;ARE WE DOING AN EMT
598      002006 001403      BEQ      ALT3E
599      002010 010667 002010      MOV      SP,SAVE        ;STACK IN SAVE REG.
600      002014 000000      HALT      ;STACK INCORRECT
601      002016 022767 004016 176744 ALT3E: CMP      #LRTI,770    ;DOES STACK CONTAIN CORRECT INFO
602      002024 001711      BEQ      ALTST2         ;YES EXIT
603      002026 011667 001772      MOV      (SP),SAVE
604      002032 000000      HALT      ;STACK CONTAINS WRONG ADDRESS

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605 ;
606 ;
607 ;
608 002034 000000 ALT3X: HALT ;EMT ACTIVE INSTEAD OF POWER FAIL ON POWER DOWN
609 ;EMT ACTIVE ON RESTART INSTEAD OF POWER FAIL
610 ;
611 ;
612 ;ROUTINE TO CHECK TWO MILLISECOND STORE TIME
613 ;AVERAGE INSTRUCTION TIME
614 ;ROUTINE WAITS FOR SHUT DOWN IN EMT LOOP
615 ;
616 002036 012706 001000 TEST3: MOV #1000, SP ;SET UP STACK
617 002042 004767 002020 JSR PC, SETSWR ;SET UP SWR POINTER
618 002046 004767 002136 JSR PC, UPDATE ;UPDATE SWR
619 002052 012706 001000 LPTST3: MOV #1000,SP ;SET UP STACK
620 002056 012767 002112 175740 MOV #TEST3A,PFHAND ;SET UP POWER FAIL STORE POINTER
621 002064 012767 000005 175734 MOV #5,PFHAND+2 ;SET UP STATUS
622 002072 000001 WAIT ;WAIT FOR INTERRUPT
623 002074 004767 002042 JSR PC, PRINT ;END-OF-PASS MSG
624 002100 005060 MSG7
625 002102 005767 176070 TST SWREG ;LOOP ON TEST?
626 002106 002361 BGE LPTST3 ;YES
627 002110 000000 HALT ;NORMAL TEST HALT NO ERRORS
628 ;LOOP ON TEST
629 ;RESTART PROGRAM
630 ;OPERATOR MUST TURN POWER OFF AND ON HERE
631 ;
632 ;
633 ;TEST FOR 2 MILLISECONDS OF AVERAGE INSTRUCTION TIME
634 ;TIME OF LOOP 57.4 MICROSECONDS
635 002112 022706 000774 TEST3A: CMP #774,SP ;IS STACK CORRECT
636 002116 001411 BEQ TEST3B ;STACKER IS CORRECT
637 002120 010667 001700 MOV SP,SAVE ;CONTENTS OF STACK IN SAVE REG.
638 002124 012767 002140 175672 MOV #HALT12E,PFHAND ;SETUP ERROR HALT
639 002132 012767 000000 175666 MOV #0,PFHAND+2 ;SETUP STATUS WORD
640 002140 000000 HALT12E:HALT ;WAIT FOR RE-START
641 002142 012767 004016 175660 TEST3B: MOV #LRTI,EMTRP ;SET UP EMULATOR TRAP
642 002150 012767 000005 175654 MOV #5,EMTRP+2 ;SET UP EMULATOR STATUS
643 002156 005067 001660 CLR SAVE7 ;SET COUNT TO ZERO
644 002162 013746 000010 MOV #10,-(SP) ;SAVE ILLEGAL INSTRUCTION ;DD001
645 002166 013746 000012 MOV #12,-(SP) ;TRAP VECTOR ;DD001
646 002172 012737 002362 000010 MOV #ORION1,#10 ; ;DD001
647 002200 005000 CLR R0 ;CLEAR R0 ;DD001
648 002202 000007 MFPT ;WHAT KIND OF CPU? ;DD001
649 002204 012637 000012 304: MOV (SP)+,#12 ;RESTORE ;DD001
650 002210 012637 000010 MOV (SP)+,#10 ;TRAP VECTOR ;DD001
651 002214 022700 000005 CMP #5,R0 ;IF R0=5,IT IS J-11 ;DD001
652 002220 001430 BEQ TIMLOP ;GO TO ROUTINE FOR ORION ;DD001
653 002222 104000 TIMLOP: EMT+0 ;EMT TRAP (EMT LOOP=57.4 MICROSEC)
654 002224 022706 000774 CMP #774,SP ;IS STACK CORRECT AFTER EMT
655 002230 001407 BEQ TEST3D ;STACK CORRECT CONTINUE
656 002232 012767 002246 175564 MOV #HALT13E,PFHAND ;SETUP ERROR HALT
657 002240 012767 000000 175560 MOV #0,PFHAND+2 ;SETUP STATUS
658 002246 000000 HALT13E:HALT ;WAIT FOR RE-START
659 002250 062767 000001 001564 TEST3D: ADD #1,SAVE7 ;+1 COUNT
660 002256 022767 000043 001556 CMP #35.,SAVE7 ;HAS LOOP TAKEN 2 MILLISECONDS

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661 002264 001356          BNE    TIMLOP      ;TIME LESS THAN 2 MILLISECONDS
662 002266 012767 002364 175530  MOV    #TEST3CH,PFHAND ;SET POWER FAIL POINTER
663 002274 010667 001524          MOV    SP,SAVE      ;SAVE STACK
664 002300 000000          HALT                   ;ROUTINE COMPLETE
665 002302 104000          TIMLOQ: EMT+0        ;EMT TRAP (EMT LOOP=13.0 MICROSEC);DD001
666 002304 022706 000774          CMP    #774,SP      ;IS STACK CORRECT AFTER EMT ;DD001
667 002310 001407          BEQ    TEST3Q       ;STACK CORRECT, CONTINUE ;DD001
668 002312 012767 002326 175504  MOV    #HALT3Q,PFHAND ;SETUP ERROR HALT ;DD001
669 002320 012767 000000 175500  MOV    #0,PFHAND+2   ;SETUP STATUS ;DD001
670 002326 000000          HALT3Q:HALT        ;WAIT FOR RESTART ;DD001
671 002330 062767 000001 001504  TEST3Q: ADD    #1,SAVE7 ;+1 COUNT ;DD001
672 002336 022767 000232 001476  CMP    #154.,SAVE7  ;HAS LOOP TAKEN 2 MILLISECONDS ;DD001
673 002344 001356          BNE    TIMLOQ       ;TIME LESS THAN 2 MILLISECS ;DD001
674 002346 012767 002364 175450  MOV    #TEST3CH,PFHAND ;SET POWER FAIL POINTER ;DD001
675 002354 010667 001444          MOV    SP,SAVE      ;SAVE STACK ;DD001
676 002360 000000          HALT                   ;ROUTINE COMPLETE ;DD001
677 002362 000002          ORION1: RTI
678 ;
679 ;
680 ;PROGRAM RESTART ROUTINE
681 ;
682 ;
683 002364 016706 001434          TEST3CH: MOV    SAVE,SP ;RESTORE STACK
684 002370 000002          RTI ;RETURN TO TEST3
685 ;
686 ;
687 ;
688 ;
689 ;
690 ;ROUTINE TO TEST FOR 2 MILLISECONDS OF AVERAGE INSTRUCTION TIME
691 ;ACTIVE TIME BEFORE NEXT POWER LOW FLAG.
692 ;EMT LOOP TAKES 56 MICROSECONDS
693 ;THE OPERATOR MUST TURN POWER OFF AND ON
694 ;VIGOROUSLY
695 ;
696 002372 012706 001000          TEST4: MOV    #1000, SP ;SET UP STACK
697 002376 004767 001464          JSR    PC, SETSWR ;SET UP SWR POINTER
698 002402 004767 001602          JSR    PC, UPDATE ;UPDATE SWR
699 002406 012706 001000          LPTST4: MOV    #1000,SP ;SET UP STACK
700 002412 012767 002446 175404  MOV    #TEST4A,PFHAND ;SET POINTER TO HALT
701 002420 012767 000005 175400  MOV    #5,PFHAND+2 ;SET UP STATUS
702 002426 000001          WAIT ;WAIT FOR POWER FAIL
703 002430 004767 001506          TEST4E: JSR    PC, PRINT ;END-OF-PASS MSG
704 002434 005106          MSG8
705 002436 005767 175534          TST    SWREG ;LOOP ON TEST?
706 002442 002361          BGE    LPTST4 ;YES
707 002444 000000          HALT ;HALT TEST OVER NO ERRORS
708 ;
709 ;
710 ;
711 002446 022706 000774          TEST4A: CMP    #774,SP ;IS STACK CORRECT
712 002452 001411          BEQ    TEST4B
713 002454 010667 001344          MOV    SP,SAVE ;STACK IN SAVE REG
714 002460 012767 002474 175336  MOV    #HALT14E,PFHAND
715 002466 012767 000005 175332  MOV    #5,PFHAND+2
716 002474 000000          HALT14E:HALT ;STACK DID NOT CONTAIN 774

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717 002476 012767 002520 175320 TEST4B: MOV #TEST4CH,PFHAND ;SET UP RE-START POINTER
718 002504 012767 000005 175314 MOV #5,PFHAND+2 ;SET UP STATUS
719 002512 010667 001306 MOV SP,SAVE
720 002516 000000 HALT
721 ;
722 ;ROUTINE TO TEST FOR 2 MILLISECONDS UP TIME (AVERAGE INSTRUCTION TIME)
723 ;
724 ;
725 002520 012767 002654 175276 TEST4CH:MOV #HALT15E,PFHAND ;SET UP HALT IF TRAP OCCURS BEFORE 2 MILLISECONDS
726 002526 012767 004016 175274 MOV #LRTI,EMTRP ;SET UP EMULATOR TRAP
727 002534 016706 001264 MOV SAVE,SP ;RESTORE STACK
728 002540 005067 001276 CLR SAVE7 ;ZERO SAVE 7
729 002544 013746 000010 MOV @#10,-(SP) ;SAVE ILLEGAL INSTRUCTION ;DD001
730 002550 013746 000012 MOV @#12,-(SP) ;TRAP VECTOR ;DD001
731 002554 012737 002732 000010 MOV #ORION2,@#10 ; ;DD001
732 002562 005000 CLR R0 ;CLEAR R0 ;DD001
733 002564 000007 MFPT ;WHAT KIND OF CPU ;DD001
734 002566 012637 000012 20$: MOV (SP)+,@#12 ;RESTORE ;DD001
735 002572 012637 000010 MOV (SP)+,@#10 ;TRAP VECTOR ;DD001
736 002576 022700 000005 CMP #5,R0 ;IF R0=5, IT IS J-11 ;DD001
737 002602 001426 BEQ QPTIME ;GO TO ROUTINE FOR ORION ;DD001
738 002604 104001 UPTIME: EMT+1 ;EMT TRAP (LOOP=56 MICROSEC)
739 002606 022706 000774 CMP #774,SP ;TEST STACK
740 002612 001407 BEQ TEST4D ;STACK IS CORRECT CONTINUE
741 002614 012767 002656 175202 MOV #HALT16E,PFHAND ;SET UP ERROR HALT
742 002622 012767 000000 175176 MOV #0,PFHAND+2 ;SET UP STATUS
743 002630 000001 WAIT ;WAIT FOR POWER FAIL
744 002632 062767 000001 001202 TEST4D: ADD #1,SAVE7 ;+1 COUNTER
745 002640 022767 000044 001174 CMP #36.,SAVE7 ;HAS LOOP TAKEN 2 MILLISECONDS
746 002646 001356 BNE UPTIME ;NOT YET 2 MILLISECONDS
747 002650 000167 177554 JMP TEST4E ;THE POWER HAS BEEN UP FOR 2 MILLISECONDS
748 002654 000000 HALT15E:HALT ;WE DID NOT HAVE 2 MILLISECONDS OF POWER OK
749 002656 000000 HALT16E:HALT ;STACK INCORRECT AFTER EMULATOR TRAP
750 ;
751 002660 104001 QPTIME: EMT+1 ;EMT TRAP (LOOP=13.0 MICROSECS) ;DD001
752 002662 022706 000774 CMP #774,SP ;TEST STACK ;DD001
753 002666 001407 BEQ TEST4Q ;STACK IS CORRECT, CONTINUE ;DD001
754 002670 012767 002730 175126 MOV #HALT4Q,PFHAND ;SET UP ERROR HALT ;DD001
755 002676 012767 000000 175122 MOV #0,PFHAND+2 ;SET UP STATUS ;DD001
756 002704 000001 WAIT ;WAIT FOR POWER FAIL ;DD001
757 002706 062767 000001 001126 TEST4Q: ADD #1,SAVE7 ;+1 COUNTER ;DD001
758 002714 022767 000232 001120 CMP #154.,SAVE7 ;HAS LOOP TAKEN 2 MILLISECS ;DD001
759 002722 001356 BNE QPTIME ;NOT YET ;DD001
760 002724 000167 177500 JMP TEST4E ;2 MILLISECS UP! ;DD001
761 002730 000000 HALT4Q:HALT ; ;DD001
762 002732 000002 ORION2: RTI ; ;DD001
763 ;
764 ;
765 ;
766 ;
767 ;
768 ;MEMORY POWER ON/OFF TEST
769 ;LOAD MEMORY WITH SET DATA PATTERN
770 ;THEN COMPARE DATA FOR BIT DROP OUT OR BIT PICK UP
771 ;RE-ENTER COMPARE ROUTINE IF POWER FAIL OCCURS
772 ;

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773 ;ROUTINE TO DETERMINE THE AMOUNT OF MEMORY
774 ;ROUTINE TESTS FOR A MAX OF 28K
775 ;
776 002734 012706 001000 ;TEST5: MOV #1000, SP ;SET UP STACK
777 002740 004767 001176 JSR PC, PRINT ;OUTPUT TITLE
778 002744 004610 MSG1
779 002746 004767 001114 JSR PC, SETSWR ;SET UP SWR POINTER
780 002752 004767 001232 JSR PC, UPDATE ;UPDATE SWR
781 002756 005067 001040 CLR TEMPST ;CLEAR TEMP. STORAGE
782 002762 005067 002216 CLR PINFLG ;CLEAR PWR INT FLAG
783 002766 012767 003034 175010 LPTST5: MOV #TREMST,4 ;SET UP FOR BUS TRAP
784 002774 012767 000340 175004 MOV #340,6 ;LOCK UP PRIORITY LEVELS
785 003002 012706 001000 MOV #1000,SP
786 003006 005067 001012 CLR SAVE ;SET UP TEST FOR 8K
787 003012 005777 001006 EXMST: TST @SAVE ;TEST MEMORY FOR AVAILABILITY
788 003016 062767 004000 001000 ADD #4000,SAVE ;SET UP TEST FOR NEXT 1K
789 003024 022767 160000 000772 CMP #160000,SAVE ;TEST FOR BUS TRAP ERROR
790 003032 001367 BNE EXMST ;TEST NEXT 4K BLOCK
791 003034 005737 000042 TREMST: TST @#42
792 003040 001407 BEQ .+20
793 003042 022737 003340 000042 CMP #LOGICAL,@#42
794 003050 001403 BEQ .+10
795 003052 162767 003000 000744 SUB #3000,SAVE
796 003060 162767 000500 000736 SUB #500,SAVE ;SET UP FOR LAST AVAILABLE BANK
797 003066 016767 000732 000724 MOV SAVE,HLIMIT ;LAST AVAILABLE MEMORY ADDRESS
798 003074 012767 000006 174702 MOV #6,4 ;RESTORE TRAP HALT POINTER
799 003102 016767 000706 174676 MOV HLT,6 ;RESTORE HALT.
800 003110 012767 003424 174706 MOV #TEST5A,PFHAND ;SET UP POINTER
801 003116 012706 001000 MOV #1000,SP ;SET UP STACK
802 003122 012702 005206 MOV #LLIMIT,#2 ;LOW MEMORY LIMIT
803 003126 012722 152525 FILDAT: MOV #152525,(2)+ ;LOAD DATA INTO MEMORY
804 003132 026702 000662 CMP HLIMIT,#2 ;COMPARE FOR LAST MEMEORY LOCATION
805 003136 001373 BNE FILDAT ;LOAD NEXT LOCATION
806 003140 012702 005206 CMDX: MOV #LLIMIT,#2 ;SETUP FOR COMPARE
807 003144 026702 000650 CMDAT: CMP HLIMIT,#2 ;TEST FOR LAST ADDRESS
808 003150 001103 BNE ACTMOD
809 ;
810 ;TEST THE TTY BUFFER
811 ;FOR A CONTRCL-G
812 ;
813 003152 105737 177560 TSTB @#TKS ;CHAR IN BUFFER?
814 003156 100020 BPL 50$ ;NO
815 003160 013705 177562 MOV @#TKB, #5 ;STORE CHAR
816 003164 042705 177600 BIC #177600, #5 ;STRIP 8TH BIT
817 003170 122705 000007 CMPB #7, #5 ;CONTROL-G?
818 003174 001401 BEQ 40$ ;YES
819 003176 000410 BR 50$ ;NO
820 003200 016767 174772 001772 40$: MOV SWREG, TEMSWR ;SAVE SWREG
821 003206 042767 040000 174762 BIC #40000, SWREG ;ENABLE TTY PRINTING
822 003214 004767 000776 JSR PC, UPDAT1 ;UPDATE SWR
823 003220 105767 000576 50$: TSTB TEMPST ;PWR FAIL OCCURRED?
824 003224 100016 BPL EOP ;NO
825 003226 032767 040000 174742 BIT #40000, SWREG ;TTY PRINTING DISABLED?
826 003234 001026 BNE CKACT ;YES
827 003236 012767 000001 001740 MOV #1, PINFLG ;SET PWR INT FLAG
828 003244 004767 000672 JSR PC, PRINT ;OUTPUT PWR FAIL MSG

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829 003250 004052          MSG
830 003252 005067 001726  CLR      PINFLG      ;CLEAR PWR INT FLAG
831 003256 005067 000540  CLR      TEMPST      ;
832 003262 032767 040000 174706 EOP:   BIT      #40000, SWREG ;TTY PRINTING DISABLED?
833 003270 001010          BNE      CKACT       ;YES
834 003272 012767 000001 001704  MOV      #1, PINFLG  ;SET PWR INT FLAG
835 003300 004767 000636          JSR      PC, PRINT   ;END-OF-PASS MSG
836 003304 004674          MSG2
837 003306 005067 001672          CLR      PINFLG      ;CLEAR PWR INT FLAG
838 003312 013700 000042          CKACT:  MOV      @#42,#0 ;
839 003316 001004          BNE      AUTO        ;BR IN AUTO MODE
840 003320 005767 174652          TST      SWREG       ;LOOP ON TEST?
841 003324 002013          BGE      LOC         ;YES
842 003326 000000          HALT                    ;HALT TEST OVER NO ERRORS
843 003330 005767 000456          AUTO:  TST      FLAG
844 003334 001407          BEQ      LOC
845 003336 000005          RESET
846 003340 004710          LOGICAL: JSR      #7,(0)
847 003342 C00240          NOP
848 003344 000240          NOP
849 003346 000240          NOP
850 003350 000137 000200          JMP      @#200
851 003354 000167 177406          LOC:   JMP      LPTST5
852 003360 022722 152525          ACTMOD: CMP      #152525,(2)+ ;TEST DATA
853 003364 001667          BEQ      CMDAT       ;COMPARE NEXT WORD
854 003366 010267 000434          MOV      #2,SAVE1   ;ADDRESS OF ERROR+2
855 003372 162767 000002 000426  SUB      #2,SAVE1   ;SUBTRACT TO CALCULATE CORRECT ADDRESS
856 003400 016700 000422          MOV      SAVE1,LIGHTS ;DATA ERROR IN THIS ADDRESS
857 003404 012767 003412 174412  MOV      #HALT18E,PFHAND ;SET UP POWER FAIL TRAP FOR ERROR
858 003412 000000          HALT18E:HALT        ;LOC DATA LIGHTS CONTAINS BAD DATA
859
860          ;FAILING ADDRESS IN DATA LIGHTS
861 003414 017700 000406          CONAD:  MOV      @SAVE1,LIGHTS ;PUT DATA IN DISPLAY LIGHTS
862 003420 000000          HALT19E:HALT        ;BAD DATA
863 003422 000650          CONAC:  BR       CMDAT       ;COMPARE NEXT WORD
864          ;ENTER THIS ROUTINE WHEN POWER FAIL OCCURRS
865          ;STORE ALL ACTIVE REGISTERS THEN HALT;
866 003424 010046          TEST5A: MOV      LIGHTS,-(SP) ;SAVE LIGHTS
867 003426 010246          MOV      #2,-(SP)   ;SAVE MEMORY ADDRESS
868 003430 005767 001550          TST      PINFLG     ;PWR FAIL DURING PRINTOUT?
869 003434 001053          BNE      BR1        ;YES
870 003436 022706 000770          CMP      #770,SP    ;IS STACK CORRECT
871 003442 001411          BEQ      TEST5E     ;STACK CORRECT
872 003444 010667 000354          MOV      SP,SAVE   ;STACK SAVED
873 003450 012767 003464 174346  MOV      #HALT20E,PFHAND
874 003456 012767 000005 174342  MOV      #5,PFHAND+2 ;SET UP STATUS
875 003464 000000          HALT20E:HALT        ;WAIT FOR RE-START
876 003466 012767 004006 174330  TEST5E: MOV      #HALT21E,PFHAND ;SET UP FOR 2 MILLISECOND DOWN TIME ERROR
877 003474 012767 000005 174324  MOV      #5,PFHAND+2 ;AVERAGE INSTRUCTION TIME
878 003502 012767 004016 174320  MOV      #LRTI,EMTRP ;SET UP EMULATOR TRAP
879 003510 012767 000005 174314  MOV      #5,EMTRP+2
880 003516 005067 000320          CLR      SAVE7      ;CLEAR COUNT REGISTER
881 003522 104002          MASTIM: EMT      +2    ;EXECUTE EMT
882 003524 022706 000770          CMP      #770,SP    ;IS STACK CORRECT AFTER TRAP
883 003530 001406          BEQ      XTIME      ;YES
884 003532 010667 000266          MOV      SP,SAVE

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885 003536 012767 003544 174260      MOV      #HALT22E,PFHAND ;NO SET UP ERROR TRAP STACK NOT CORRECT
886 003544 000000      HALT22E:HALT          ;STACK SHOULD EQUAL 770 (SAVE REG.
887                                     ;CONTAINS CONTENTS OF STACK)
888 003546 062767 000001 000266      XTIME:  ADD      #1,SAVE7          ;ADD TO TIME COUNT
889 003554 022767 000027 000260      CMP      #23.,SAVE7         ;IS TIME OK
890 003562 001357                                     BNE      MASTIM
891 003564 012767 003622 174232      BR1:    MOV      #TEST5CH,PFHAND ;YES SETUP RESTART ADDRESS
892 003572 012767 000005 174226      MOV      #5,PFHAND+2        ;SAVE STACK
893 003600 010667 000220      MOV      SP,SAVE            ;
894 003604 010367 000234      MOV      #3,      SAVE8      ;SAVE REGISTERS
895 003610 010467 000232      MOV      #4,      SAVE9
896 003614 010567 000230      MOV      #5,      SAVE10
897 003620 000000      HALT
898                                     ;
899                                     ;RESTORE ACTIVE REGISTERS AND RETURN FROM INTERRUPT
900                                     ;
901                                     ;
902                                     ;
903 003622 C16706 000176      TESTSCH:MOV     SAVE,SP        ;RESTORE STACK
904 003626 016703 000212      MOV      SAVE8, #3          ;RESTORE REGISTERS
905 003632 016704 000210      MOV      SAVE9, #4
906 003636 016705 000206      MOV      SAVE10, #5
907 003642 005767 001336      TST      PINFLG             ;PWR FAIL DURING PRINTOUT?
908 003646 001040      BNE      BR2                ;YES
909 003650 022706 000770      CMP      #770,SP           ;IS STACK CORRECT
910 003654 001404      BEQ      UPXTIM
911 003656 012767 003664 174140      MOV      #HALT23E,PFHAND    ;SET UP FOR STACK ERROR TRAP
912 003664 000000      HALT23E:HALT
913 003666 012767 004010 174130      UPXTIM:MOV     #HALT24E,PFHAND ;SET UP FOR 2 MILLISECOND UP TIME ERROR
914 003674 012767 000005 174124      MOV      #5,PFHAND+2
915 003702 005067 000134      CLR      SAVE7              ;CLEAR COUNT REGISTER
916 003706 104003      EMTUP:  EMT      +3          ;EXECUTE EMULATOR TRAP
917 003710 062767 000001 000124      ADD      #1,SAVE7           ;INCREMENT EMULATOR TRAP COUNT
918 003716 022706 000770      CMP      #770,SP           ;IS STACK CORRECT AFTER EMT
919 003722 001406      BEQ      CNTEMT             ;YES
920 003724 012767 003736 174072      MOV      #HALT25E,PFHAND    ;STACK NOT CORRECT(SET UP ERROR HALT)
921 003732 010667 000066      MOV      SP,SAVE
922 003736 000000      HALT25E:HALT              ;STACK DID NOT = 770(SAVE REGISTER
923                                     ;CONTAINS CONTENTS OF STACK
924 003740 022767 000043 000074      CNTEMT: CMP      #35.,SAVE7    ;HAS POWER BEEN UP 2 MILLISECONDS
925 003746 001357      BNE      EMTUP
926 003750 012602      BR2:    MOV      (SP)+,#2      ;NO EXECUTE NEXT EMT
927 003752 012600      MOV      (SP)+,LIGHTS       ;YES TIME OK
928 003754 012767 003424 174042      MOV      #TEST5A,PFHAND    ;REST ARE ACTIVE REGISTER
929 003762 012767 000005 174036      MOV      #5,PFHAND+2        ;RETURN FROM POWER FAIL TRAP
930 003770 012767 177777 000014      MOV      #177777,FLAG       ;SET POWER FAIL FLAG
931 003776 152767 000200 000016      BISB    #200,TEMPST
932 004004 000002      RTI
933 004006 000000      HALT21E:HALT              ;WE DID NOT HAVE TWO MILLISECONDS TO STORE ACTIVE REG.
934 004010 000000      HALT24E:HALT              ;POWER WAS NOT ACTIVE FOR TWO MILLISECONDS
935                                     ;
936                                     ;
937                                     ;
938                                     ;
939                                     ;
940                                     ;

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941
942      000240      ;
943      004012      177777      NOP=240
944      004014      000000      FLAG:177777
945      004016      000002      HLT: HALT
946      004020      017500      LRTI: RTI
947      004022      000000      HLIMIT: 17500
948
949
950      004024      000000      ;WORK REGISTERS
951      004026      000004      SAVE: 0
952      004030      000000      SAVE1: 4
953      004032      000000      SAVE2: 0
954      004034      000000      SAVE3: 0
955      004036      000000      SAVE4: 0
956      004040      000000      SAVE5: 0
957      004042      000000      SAVE6: 0
958      004044      000000      SAVE7: 0
959      004046      000000      SAVE8: 0
960      004050      000000      SAVE9: 0
961
962
963      177560      TKS=177560
964      177562      TKB=177562
965      177564      TPS=177564
966      177566      TPB=177566
967      004052      005015      053520      020122      MSG: .ASCIZ <15><12>.PWR FAIL.
968      004060      040506      046111      000
969
970
971      004066      013746      000006      SETSWR: MOV @#6,-(SP) ;SAVE CURRENT VECTOR
972      004072      013746      000004      MOV @#4,-(SP)
973      004076      012737      004112      000004      MOV @1,@#4 ;SET UP TIMEOUT VECTOR
974      004104      005777      174124      TST @SWRG ;TRY TO REFERENCE HARDWARE SWR
975      004110      000404      BR 2# ;BR IF NO TIMEOUT OCCURS
976      004112      012767      000176      174114      1#: MOV @SWREG,SWRG ;POINT TO SOFTWARE SWR
977      004120      022626      CMP (SP)+,@#4 ;RESTORE STACK
978      004122      012637      000004      2#: MOV (SP)+,@#4 ;RESTORE TIMEOUT VECTOR
979      004126      012637      000006      MOV (SP)+,@#6
980      004132      017767      174076      174036      MOV @SWRG, SWREG ;SAVE SWR AT LOC 176
981      004140      000207      RTS PC
982
983      004142      032767      040000      174026      PRINT: BIT #40000, SWREG ;SR14 SET?
984      004150      001014      BNE RETURN ;YES -DISABLE PRINTING
985      004152      023727      000042      003340      CMP @#42, #LOGICAL ;UNDER ACT?
986      004160      001410      BEQ RETURN ;YES
987      004162      011603      MOV (SP), #3 ;ADDRESS OF MSG AFTER JSR
988      004164      011303      MOV (#3), #3 ;ADDRESS OF FIRST CHAR OF MSG
989      004166      105737      177564      4#: TSTB @#TPS ;BUFFER READY?
990      004172      100375      BPL 4# ;NO-LOOP
991      004174      112337      177566      MOVB (#3)+, @#TPB ;YES-PUT MSG CHAR INTO BUFFER
992      004200      001372      BNE 4# ;CONTINUE IF CHAR WAS NOT 0
993      004202      062716      000002      RETURN: ADD #2, (SP) ;SET UP RETURN
994      004206      000207      RTS PC ;RETURN TO TEST
995      004210      016767      173762      000762      UPDATE: MOV SWREG, TEMSWR ;STORE SWR VALUE
996      004216      032767      040000      173752      UPDAT1: BIT #40000, SWREG ;TTY PRINTING DISABLED?

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997	004224	001016			BNE	90\$:YES-RETURN TO TEST
998	004226	023727	000042	003340	CMP	@#42.	#LOGICAL	:UNDER ACT?
999	004234	001412			BEQ	90\$:YES-RETURN TO TEST
1000	004236	004767	177700		JSR	PC.	PRINT	
1001	004242	005134			MSG9			
1002	004244	004767	000014		JSR	PC.	OUTPUT	:PRINT CURRENT SWR VALUE
1003	004250	004767	177666		JSR	PC.	PRINT	
1004	004254	005143			MSG10			
1005	004256	004767	000102		JSR	PC.	INPUT	:UPDATE OR SAVE SWR
1006	004262	000207			RTS	PC		
1007								
1008								:PRINT CURRENT SWR
1009								:AT THE TTY
1010								
1011	004264	012704	005160		OUTPUT: MOV	#TABLE, #4		:POINT TO TABLE
1012	004270	016714	000704		MOV	TEMSWR, (#4)		:MOVE SAVED SWR TO TABLE
1013	004274	011467	000702		8\$: MOV	(#4), ROTATE		:SAVE CURRENT VALUE
1014	004300	042714	177770		BIC	#177770,		(#4) :CONVERT ONE ASCII CHAR
1015	004304	C62724	000060		ADD	#60, (#4)+		:POINT TO NEXT LOC IN TABLE
1016	004310	022704	005174		CMP	#TABLE+14,		#4 :IF 6TH DIGIT-
1017	004314	001411			BEQ	10\$:BR
1018	004316	016714	000660		MOV	ROTATE, (#4)		:POINT TO NEXT CHAR
1019	004322	000241			CLC			
1020	004324	006014			ROR	(#4)		
1021	004326	000241			CLC			
1022	004330	006014			ROR	(#4)		
1023	004332	000241			CLC			
1024	004334	006014			ROR	(#4)		
1025	004336	000756			BR	8\$		
1026	004340	105737	177564		10\$: TSTB	@#TPS		:PRINTER READY?
1027	004344	100375			BPL	10\$		
1028	004346	014437	177566		MOV	-(#4), @#TPB		:OUTPUT CHAR IN TABLE
1029	004352	022704	005160		CMP	#TABLE, #4		:OUTPUT ALL CHAR IN TABLE
1030	004356	001401			BEQ	12\$		
1031	004360	000767			BR	10\$:CONTINUE
1032	004362	000207			12\$: RTS	PC		
1033								
1034								:UPDATE OR SAVE SWR
1035								
1036								
1037	004364	005067	000606		INPUT: CLR	CNTR		:CLEAR CHARACTER COUNTER
1038	004370	005067	000600		CLR	USWREG		:CLEAR LAST UPDATED SWR
1039	004374	012704	005160		MOV	#TABLE, #4		:POINT TO TABLE
1040	004400	105737	177560		14\$: TSTB	@#TKS		:CHAR IN BUFFER?
1041	004404	100375			BPL	14\$:NO
1042	004406	013714	177562		MOV	@#TKB, (#4)		:PUT CHAR IN TABLE
1043	004412	105737	177564		16\$: TSTB	@#TPS		:PRINTER READY?
1044	004416	100375			BPL	16\$:NO
1045	004420	011437	177566		MOV	(#4), @#TPB		:ECHO INPUT
1046	004424	042714	177600		BIC	#177600,		(#4) :STRIP 8TH BIT
1047	004430	122714	000015		CMPB	#15, (#4)		:CARRIAGE RETURN?
1048	004434	001417			BEQ	20\$:YES
1049	004436	122714	000060		CMPB	#60, (#4)		:ILLEGAL CHAR?
1050	004442	003055			BGT	22\$:YES
1051	004444	122714	000067		CMPB	#67, (#4)		:ILLEGAL CHAR?
1052	004450	002452			BLT	22\$:YES

1053	004452	022767	000006	000516			CMP	#6,	CNTR	:7TH DIGIT?
1054	004460	003446					BLE	22#		:YES
1055	004462	062704	000002				ADD	#2,	#4	:POINT TO NEXT TABLE LOC
1056	004466	005267	000504				INC	CNTR		:INCREMENT CHARACTER COUNTER
1057	004472	000742					BR	14#		:CONTINUE
1058	004474	005014			20#:		CLR	(#4)		:CLEAR CR FROM TABLE
1059	004476	005767	000474				TST	CNTR		:IF NO DIGITS WERE INPUT-
1060	004502	001431					BEQ	24#		:GO SAVE OLD SWR VALUE
1061	004504	012704	005160				MOV	#TABLE,	#4	:POINT TO TABLE
1062	004510	042714	000060		26#:		BIC	#60,	(#4)	:STRIP ASCII BITS
1063	004514	062467	000454				ADD	(#4),	USWREG	:CREATE UPDATED SWR VALUE
1064	004520	005367	000452				DEC	CNTR		:DECREMENT CHARACTER COUNTER
1065	004524	005767	000446				TST	CNTR		:LAST CHAR INPUT?
1066	004530	001412					BEQ	28#		:YES
1067	004532	000241					CLC			:NO-ROTATE DIGITS
1068	004534	006167	000434				ROL	USWREG		
1069	004540	000241					CLC			
1070	004542	006167	000426				ROL	USWREG		
1071	004546	000241					CLC			
1072	004550	006167	000420				ROL	USWREG		
1073	004554	000755					BR	26#		:CONTINUE
1074	004556	016767	000412	173412	28#:		MOV	USWREG,	SWREG	:MOVE NEW VALUE TO LOC 176
1075	004564	000207					PC			:RETURN
1076	004566	016767	000406	173402	24#:		MOV	TEMSWR,	SWREG	:RESTORE OLD SWR VALUE
1077	004574	000207					RTS	PC		:RETURN
1078	004576	004767	177340		22#:		JSR	PC,	PRINT	:REPEAT PROMPTING MSG
1079	004602	005143					MSG10			:
1080	004604	000167	177554				JMP	INPUT		:BEGIN THIS ROUTINE AGAIN
1081										:
1082										:
1083										:
1084										:
1085										:
1086	004610	005015	055103	040513	MSG1:		.ASCII<15><12>/CZKAQH POWER FAIL/			
1087	004616	044121	050040	053517						
1088	004624	051105	043040	044501						
1089	004632	114								
1090	004633	015	050012	050104			.ASCIZ<15><12>/PDP-11 POWER FAIL DIAGNOSTIC/<15><12>			
1091	004640	030455	020061	047520						
1092	004646	042527	020122	040506						
1093	004654	046111	042040	040511						
1094	004662	047107	051517	044524						
1095	004670	006503	000012							
1096	004674	005015	054105	051105	MSG2:		.ASCIZ<15><12>/EXERCISER END OF PASS/<15><12>			
1097	004702	044503	042523	020122						
1098	004710	047105	020104	043117						
1099	004716	050040	051501	006523						
1100	004724	000012								

1101	004726	005015	042524	052123	MSG3:	.ASCIZ<15><12>/TEST1 END OF PASS/<15><12>
1102	004734	020061	047105	020104		
1103	004742	043117	050040	051501		
1104	004750	006523	000012			
1105	004754	005015	042524	052123	MSG4:	.ASCIZ<15><12>/TEST2 END OF PASS/<15><12>
1106	004762	020062	047105	020104		
1107	004770	043117	050040	051501		
1108	004776	006523	000012			
1109	005002	005015	046101	042524	MSG5:	.ASCIZ<15><12>/ALTEST END OF PASS/<15><12>
1110	005010	052123	042440	042116		
1111	005016	047440	020106	040520		
1112	005024	051523	005015	000		
1113	005031	015	040412	052114	MSG6:	.ASCIZ<15><12>/ALTST1 END OF PASS/<15><12>
1114	005036	052123	020061	047105		
1115	005044	020104	043117	050040		
1116	005052	051501	006523	000012		
1117	005060	005015	042524	052123	MSG7:	.ASCIZ<15><12>/TEST3 END OF PASS/<15><12>
1118	005066	020063	047105	020104		
1119	005074	043117	050040	051501		
1120	005102	006523	000012			
1121	005106	005015	042524	052123	MSG8:	.ASCIZ<15><12>/TEST4 END OF PASS/<15><12>
1122	005114	020064	047105	020104		
1123	005122	043117	050040	051501		
1124	005130	006523	000012			
1125	005134	005015	053523	036522	MSG9:	.ASCIZ<15><12>/SWR=/ .EVEN
1126	005142	000				
1127	005143	015	005012	042516	MSG10:	.ASCIZ<15><12><12>/NEW SWR=/ . = . +14
1128	005150	020127	053523	036522		
1129	005156	000				
1130		005160				
1131	005160	005174			TABLE:	
1132	005174	000000			USWREG:	0
1133	005176	000000			CNTR:	0
1134	005200	000000			TEMSWR:	0
1135	005202	000000			ROTATE:	0
1136	005204	000000			PINFLG:	0
1137	005206	000000			LLIMIT:	0
1138		000001			.END	

.MAIN. MACY11 30(1046) 15-JUL-85 13:30 PAGE 26
 CZKAQH.P11 15-JUL-85 13:29 CROSS REFERENCE TABLE -- USER SYMBOLS

XTIME	003546	883	888#											
.	= 005210	349#	354	360	373#	375#	377#	379#	393	395#	417	421	484	487
		490	493	496	499	502	517	566	792	794	969#	1130#	1131#	

. ABS. 005210 000

ERRORS DETECTED: 0

CZKAQH,CZKAQH/CRF/SOL/NL:TOC=CZKAQH.P11
 RUN-TIME: 1 2 .4 SECONDS
 RUN-TIME RATIO: 36/4=8.7
 CORE USED: 9K (18 PAGES)