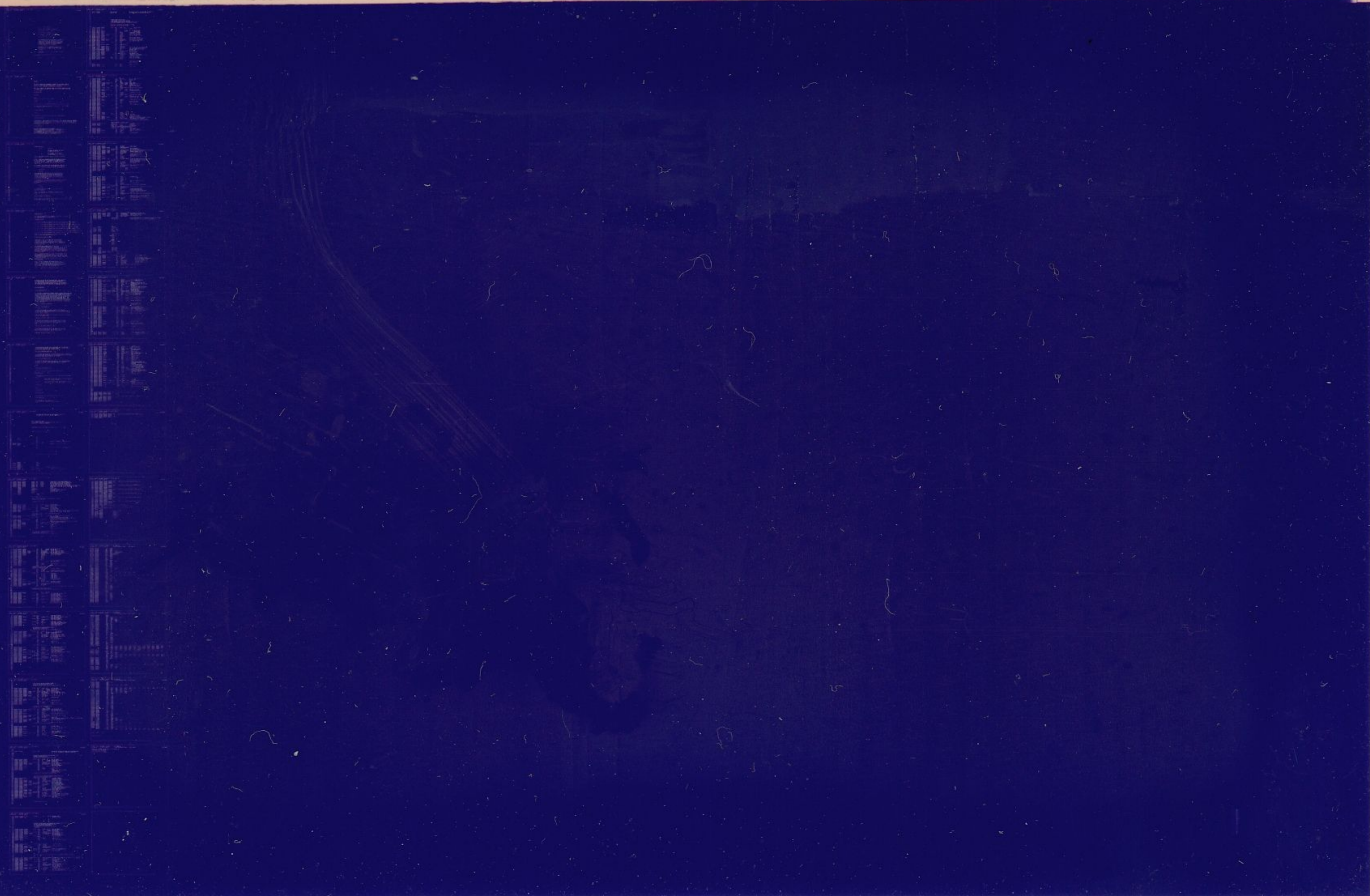


PDP11

PDP-11 POWER FAIL DIAGNOSTIC
MD-11-DZKAQ-G

EP-DZKAQ-G-DL
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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZKAQ-G-D
PRODUCT NAME: PDP-11 POWER FAIL DIAGNOSTIC
DATE RELEASED: NOVEMBER 1, 1977
MAINTAINER: DIAGNOSTIC ENGINEERING
MODIFIED BY: BILL SCHLITZKUS

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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


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385 000204 000167 000570 START1: JMP TEST1 ;ENTER TEST 1 (TEST TRAP CAPABILITY)
386 000210 000167 000676 START2: JMP TEST2 ;ENTER TEST2 (TEST RE-START CAPABILITY)
387 000214 000167 001166 STR2A: JMP ALTEST ;TEST RE-START USING BR. INSTRUCTION
388 000220 000167 001342 STR2B: JMP ALTST1 ;TEST RE-START USING EMT INSTRUCTION
389 000224 000167 001606 START3: JMP TEST3 ;ENTER TEST3 (TEST FOR 2 MILLISECONDS TIME) DOWN TIME
390 000230 000167 002014 START4: JMP TEST4 ;ENTER TEST4 (TEST FOR TWO MILLISECONDS) UP TIME
391 000006 SP=%6 ;STACK
392 000000 LIGHTS=%0 ;DATA LIGHTS
393 177776 STATUS=177776 ;LOCATION OF STATUS REGISTER
394 000007 PC=%7 ;LOCATION OF PC
395 000030 EMTRP=30 ;EMULATOR TRAP LOCATION
396 000234 SWRG=
397 000234 177570 .WORD 177570
398 001000 . =1000
399
400 ;BASIC POWER FAIL TEST
401
402 ;TEST1 IS A ROUTINE USED TO THE POWER FAIL'S ABILITY
403 ;TO TRAP TO LOCATION 24.
404
405 ;OPERATOR INSTRUCTIONS
406
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408 001000 012706 001000 TEST1: MOV #1000, SP ;SET UP STACK
409 001004 004767 002620 JSR PC, SETSWR ;SET UP SWR POINTER
410 001010 004767 002736 JSR PC, UPDATE ;UPDATE SWR
411 001014 012706 001000 LPTST1: MOV #1000, SP ;SET UP STACK
412 001020 012767 001036 176776 MOV #TEST1H, PFHAND ;SET UP POINTER
413 001026 052767 000357 176742 BIS #357, STATUS ;SET STATUS BITS
414 001034 000001 WAIT ;WAIT FOR POWER FAIL OPERATOR SHOULD TURN OFF HERE
415 001036 000000 TEST1H: HALT ;POWER FAIL HALTS HERE ON WAY DOWN
416
417 ;TEST1 CHECK - CHECK IF STACK WAS DECREMENTED AND
418 ;STATUS WAS SET UP
419 001040 026727 177730 001036 TEST1CH: CMP 774, #TEST1H ;CHECK PC AND SP (LOCATION)
420 001046 001401 BEQ .+4 ;ARE THEY EQUAL
421 001050 000000 HALT1: HALT ;ERROR! PROCESSOR FAILED TO TRAP
422 ;LOCATION 774 SHOULD CONTAIN #TEST1H IN STACK
423 001052 026727 177720 000357 CMP 776, #357 ;WAS THE STATUS STORED CORRECTLY
424 001060 001401 BEQ .+4 ;TEST
425 001062 000000 HALT2: HALT ;ERROR THE STATUS BEFORE THE TRAP WAS NOT STORED
426 001064 012700 000210 MOV #START2, LIGHTS ;SET UP LIGHTS WITH ADDRESS
427 001070 012706 001000 MOV #1000, SP ;SET UP STACK
428 001074 004767 002604 JSR PC, PRINT ;END-OF-PASS MSG
429 001100 004470 MSG3
430 001102 005767 177070 TST SWREG ;LOOP ON TEST?
431 001106 002342 BGE LPTST1 ;YES
432 001110 000000 HALT ;NORMAL HALT NO ERRORS
433
434
435 ;TEST ROUTINE TO CHECK RE-START CAPABILITY
436 ;USING THE WAIT INSTRUCTION
437 ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
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440 001112 012706 001000 TEST2: MOV #1000, SP ;SET UP STACK

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441 001116 004767 002506 JSR PC, SETSWR ;SET UP SWR POINTER
442 001122 004767 002624 JSR PC, UPDATE ;UPDATE SWR
443 001126 012767 000357 176642 LPTST2: MOV #357, STATUS ;SET UP CONDITION CODES
444 001134 012767 000005 176664 MOV #5, PFHAND+2 ;SET UP POWER FAIL CODES
445 001142 012767 001212 176654 MOV #TEST2A, PFHAND ;SET UP POINTER TO STORE ROUTINE
446 001150 012706 001100 MOV #1000, SP ;SP UP STACK POINTER
447 001154 012700 152525 MOV #152525, %0 ;SET UP FAST MEMORY
448 001160 010001 MOV %0, %1
449 001162 010102 MOV %1, %2
450 001164 010203 MOV %2, %3
451 001166 010304 MOV %3, %4
452 001170 010405 MOV %4, %5
453 001172 000001 WAIT ;WAIT FOR POWER FAIL TRAP
454 001174 004767 002504 JSR PC, PRINT ;END-OF-PASS MSG
455 001200 004516 MSG4
456 001202 005767 176770 TST SWREG ;LOOP ON TEST?
457 001206 002347 BGE LPTST2 ;YES
458 001210 000000 HALT ;NORMAL TEST HALT NO ERRORS
459 ;OPERATOR MUST TURN POWER OFF HERE
460 ;ROUTINE TO STORE ACTIVE REG.
461 001212 022706 000774 TEST2A: CMP #774, SP ;IS STACK CORRECT
462 001216 001406 BEQ TEST2B
463 001220 010667 002342 MOV SP, SAVE ;CONTENTS OF STACK SAVED.
464 001224 012767 001232 176572 MOV #HALT3E, PFHAND ;STACK CONTAINS WRONG ADDR
465 001232 000000 HALT3E: HALT
466 001234 010046 TEST2B: MOV %0, -(SP) ;STORE REG 0
467 001236 010146 MOV %1, -(SP) ;STORE REG 1
468 001240 010246 MOV %2, -(SP) ;STORE REG 2
469 001242 010346 MOV %3, -(SP) ;STORE REG 3
470 001244 010446 MOV %4, -(SP) ;STORE REG 4
471 001246 010546 MOV %5, -(SP) ;STORE REG RE STACK
472 001250 022706 000760 CMP #760, SP ;IS STACK CORRECT
473 001254 001404 BEQ TEST2D
474 001256 012767 001264 176540 MOV #HALT4E, PFHAND ;THE STACK IS WRONG
475 001264 000000 HALT4E: HALT ;WAIT FOR RESTART
476 001266 012767 001310 176530 TEST2D: MOV #TEST2CH, PFHAND ;SET UP NEW POINTER
477 001274 012767 000005 176524 MOV #5, PFHAND+2
478 001302 010667 002260 MOV SP, SAVE
479 001306 000000 HALT ;ALL ACTIVE REG. STORED. WAIT FOR RESTART.
480 ;
481 ;OPERATOR MUST TURN POWER ON HERE
482 ;ROUTINE TO RE-STORE ACTIVE REGISTER AFTER RE-START.
483 ;
484 ;
485 001310 016706 002252 TEST2CH: MOV SAVE, SP
486 001314 022726 152525 CMP #152525, (SP)+ ;TEST SAVE REG FOR FAST MEMORY
487 001320 001401 BEQ .+4 ;TEST FAST MEMORY %5
488 001322 000000 HALT5E: HALT ;SAVE REG IN ERROR
489 001324 022726 152525 CMP #152525, (SP)+ ;TEST SAVE REG FOR FAST MEMORY
490 001330 001401 BEQ .+4 ;TEST FAST MEMORY %4
491 001332 000000 HALT6E: HALT ;SAVE REG IN ERROR
492 001334 022726 152525 CMP #152525, (SP)+ ;TEST SAVE REG FOR FAST MEMORY
493 001340 001401 BEQ .+4 ;TEST FAST MEMORY %3
494 001342 000000 HALT7E: HALT ;SAVE REG IN ERROR
495 001344 022726 152525 CMP #152525, (SP)+ ;TEST SAVE REG. FOR FAST MEMORY
496 001350 001401 BEQ .+4 ;TEST FAST MEMORY %2
    
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497 001352 000000          HALT8E: HALT          ;SAVE REG IN ERROR
498 001354 022726 152525    CMP          #152525,(SP)+ ;TEST SAVE REG. FOR FAST MEMORY
499 001360 001401          BEQ          .+4          ;TEST FAST MEMORY %1
500 001362 000000          HALT9E: HALT          ;SAVE REG IN ERROR
501 001364 022726 152525    CMP          #152525,(SP)+ ;TEST FAST MEMORY %0
502 001370 001401          BEQ          .+4
503 001372 000000          HALT10E: HALT         ;SAVE REG. IN ERROR
504 001374 022706 000774    CMP          #774,SP      ;TEST STACK FOR CORRECT ADDR.
505 001400 001401          BEQ          .+4          ;STACK SHOULD HAVE 2 WORDS.
506 001402 000000          HALT11E: HALT         ;STACK HAS WRONG ADDR.
507 001404 000002          RTI           ;RETURN FROM TRAP
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513 001406 012706 001000    ALTEST: MOV     #1000, SP   ;SET UP STACK
514 001412 004767 002212    JSR     PC, SETSWR        ;SET UP SWR POINTER
515 001416 004767 002330    JSR     PC, UPDATE       ;UPDATE SWR
516 001422 012767 000357 176346 LPALT: MOV     #357,STATUS  ;SET UP CONDITION CODES
517 001430 012767 000005 176370 MOV     #5,PFHAND+2      ;SET UP POWER FAIL CODES
518 001436 012767 001470 176360 MOV     #ALT2,PFHAND     ;SET UP POWER DOWN POINTER
519 001444 012706 001000    MOV     #1000,SP        ;SET UP STACK
520 001450 000777          REALST: BR      ;WAIT FOR POWER FAIL
521 001452 004767 002226    JSR     PC, PRINT        ;END-OF-PASS MSG
522 001456 004544          MSG5
523 001460 005767 176512    TST     SWREG           ;LOOP ON TEST?
524 001464 002356          BGE     LPALT           ;YES
525 001466 000000          HALT          ;NORMAL TEST HALT NO ERRORS
526
527
528
529 001470 022706 000774    ;STORE ROUTINE FOR ALTEST
530 001474 001406          ALT2:  CMP     #774,SP    ;HAS STACK BEEN PUSHED TWICE
531 001476 010667 002064    BEQ     ALT2A           ;YES STACK CORRECT
532 001502 012767 001510 176314 MOV     SP,SAVE         ;SAVE STACK TO INTERGATE
533 001510 000000          MOV     #ALT2X,PFHAND   ;SET UP ERROR POINTER
534 001512 022767 001450 177254 ALT2X: HALT          ;STACK WAS PUSHED >2<
535 001520 001404          ALT2A: CMP     #REALST,774 ;DOES STACK CONTAIN CORRECT ADDRESS
536 001522 012767 001530 176274 BEQ     ALT2B           ;STACK CONTAIN LOC BR.
537 001530 000000          MOV     #ALT2AX,PFHAND  ;LOCATION 774 INCORRECT
538 001532 010667 002030    ALT2AX: HALT          ;SAVE STACK
539 001536 012767 001554 176260 ALT2B: MOV     SP,SAVE    ;SET UP RESTART POINTER
540 001544 012767 000005 176254 MOV     #ALT2C,PFHAND
541 001552 000000          MOV     #5,PFHAND+2
542 001554 016706 002006    ALT2C: HALT          ;END OF STORE ROUTINE
543 001560 062716 000002    MOV     SAVE,SP        ;RE-SET STACK
544 001564 000002          ADD     #2,(SP)        ;SET NEW RETURN ADDRESS
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554 ; TEST ROUTINE TO CHECK RESTART CAPABILITY
555 ; USING THE EMULATOR TRAP FOR A WAIT
556 ; OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
557 ;
558 ;
559 001566 012706 001000 ALTST1: MOV #1000, SP ; SET UP STACK
560 001572 004767 002032 JSR PC, SETSWR ; SET UP SWR POINTER
561 001576 004767 002150 JSR PC, UPDATE ; UPDATE SWR
562 001602 012767 000357 176166 LPALT1: MOV#357, STATUS ; SET UP CONDITION CODES
563 001610 012767 000005 176210 MOV #5, PFHAND+2 ; SET UP POWER FAIL CODES
564 001616 012767 001674 176200 MOV #ALT3A, PFHAND ; SET UP POWER DOWN POINTER
565 001624 012706 001000 MOV #1000, SP
566 001630 012767 003560 176172 MOV #LRT1, EMTRP ; SET UP EMT TRAP
567 001636 012767 000005 176166 MOV #5, EMTRP+2
568 001644 104002 EMTWT: EMT +2 ; EMULATOR TRAP
569 001646 000776 BR -2
570 001650 016767 001730 176152 ALTST2: MOV SAVE7, EMTRP
571 001656 004767 002022 JSR PC, PRINT ; END-OF-PASS MSG
572 001662 004573 MSG6
573 001664 005767 176306 TST SWREG ; LOOP ON TEST?
574 001670 002344 BGE LPALT1 ; YES
575 001672 000000 HALT ; NORMAL HALT NO ERRORS
576 ;
577 ; ROUTINE TO STORE ACTIVE REGISTERS
578 ; POWER DOWN
579 ;
580 001674 016767 176130 001702 ALT3A: MOV EMTRP, SAVE7 ; SAVE EMULATOR TRAP
581 001702 012767 002034 176120 MOV #ALT3X, EMTRP ; SET UP ERROR HALT
582 001710 022706 000774 CMP #774, SP ; HAS STACK BEEN PUSHED TWICE
583 001714 001414 BEQ ALT3C
584 001716 022706 000770 CMP #770, SP ; HAS STACK BEEN PUSHED 4 TIMES
585 001722 001411 BEQ ALT3C
586 001724 012767 001744 176072 ALT3B: MOV #ALT3BX, PFHAND ; SET UP POWER FAIL POINTER
587 001732 012767 000005 176066 MOV #5, PFHAND+2
588 001740 010667 001622 MOV SP, SAVE ; SAVE STACK
589 001744 000000 ALT3BX: HALT ; STACK INCORRECT (STACK PUSHED LESS THAN 2 OR MORE THAN
590 001746 012767 001770 176050 ALT3C: MOV #ALT3D, PFHAND ; SET UP RE-START POINTER
591 001754 012767 000005 176044 MOV #5, PFHAND+2 ; SET UP NEW STATUS
592 001762 010667 001600 MOV SP, SAVE
593 001766 000000 HALT ; END OF STORE ROUTINE
594 ; ROUTINE TO TEST POWER UP SEQUENCE
595 ;
596 ;
597 001770 016706 001572 ALT3D: MOV SAVE, SP ; RESTORE STACK
598 001774 022706 000774 CMP #774, SP ; WAS STACK PUSHED ONLY TWICE
599 002000 001723 BEQ ALTST2 ;
600 002002 022706 000770 CMP #770, SP ; ARE WE DOING AN EMT
601 002006 001403 BEQ ALT3E
602 002010 010667 001552 MOV SP, SAVE ; STACK IN SAVE REG.
603 002014 000000 HALT ; STACK INCORRECT
604 002016 022767 003560 176744 ALT3E: CMP #LRT1, 770 ; DOES STACK CONTAIN CORRECT INFO
605 002024 001711 BEQ ALTST2 ; YES EXIT
606 002026 011667 001534 MOV (SP), SAVE
607 002032 000000 HALT ; STACK CONTAINS WRONG ADDRESS
608 ;

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609
610
611 002034 000000      ; ALT3X:  HALT                ; EMT ACTIVE INSTEAD OF POWER FAIL ON POWER DOWN
612                                     ; EMT ACTIVE ON RESTART INSTEAD OF POWER FAIL
613
614
615      ; ROUTINE TO CHECK TWO MILLISECOND STORE TIME
616      ; AVERAGE INSTRUCTION TIME
617      ; ROUTINE WAITS FOR SHUT DOWN IN EMT LOOP
618
619 002036 012706 001000  TEST3:  MOV    #1000, SP      ; SET UP STACK
620 002042 004767 001562      JSR    PC,   SETSWR     ; SET UP SWR POINTER
621 002046 004767 001700      JSR    PC,   UPDATE    ; UPDATE SWR
622 002052 012706 001000  LPTST3: MOV    #1000, SP      ; SET UP STACK
623 002056 012767 002112 175740  MOV    #TEST3A, PFHAND ; SET UP POWER FAIL STORE POINTER
624 002064 012767 000005 175734  MOV    #5, PFHAND+2    ; SET UP STATUS
625 002072 000001          WAIT          ; WAIT FOR INTERRUPT
626 002074 004767 001604      JSR    PC,   PRINT     ; END-OF-PASS MSG
627 002100 004622          MSG7
628 002102 005767 176070      TST    SWREG          ; LOOP ON TEST?
629 002106 002361          BGE    LPTST3        ; YES
630 002110 000000          HALT           ; NORMAL TEST HALT NO ERRORS
631                                     ; LOOP ON TEST
632                                     ; RESTART PROGRAM
633      ; OPERATOR MUST TURN POWER OFF AND ON HERE
634
635
636      ; TEST FOR 2 MILLISECONDS OF AVERAGE INSTRUCTION TIME
637      ; TIME OF LOOP 57.4 MICROSECONDS
638 002112 022706 000774  TEST3A: CMP    #774, SP      ; IS STACK CORRECT
639 002116 001411          BEQ    TEST3B      ; STACKER IS CORRECT
640 002120 010667 001442      MOV    SP, SAVE      ; CONTENTS OF STACK IN SAVE REG.
641 002124 012767 002140 175672  MOV    #HALT12E, PFHAND ; SETUP ERROR HALT
642 002132 012767 000000 175666  MOV    #0, PFHAND+2    ; SETUP STATUS WORD
643 002140 000000          HALT12E: HALT        ; WAIT FOR RE-START
644 002142 012767 003560 175660  TEST3B: MOV    #LRT1, EMTRP ; SET UP EMULATOR TRAP
645 002150 012767 000005 175654  MOV    #5, EMTRP+2    ; SET UP EMULATOR STATUS
646 002156 005067 001422      CLR    SAVE7         ; SET COUNT TO ZERO
647 002162 104000          TIMLOP: EMT+0        ; EMT TRAP (EMT LOOP=57.4 MICROSEC)
648 002164 022706 000774      CMP    #774, SP      ; IS STACK CORRECT AFTER EMT
649 002170 001407          BEQ    TEST3D      ; STACK CORRECT CONTINUE
650 002172 012767 002206 175624  MOV    #HALT13E, PFHAND ; SETUP ERROR HALT
651 002200 012767 000000 175620  MOV    #0, PFHAND+2    ; SETUP STATUS
652 002206 000000          HALT13E: HALT        ; WAIT FOR RE-START
653 002210 062767 000001 001366  TEST3D: ADD    #1, SAVE7 ; +1 COUNT
654 002216 022767 000043 001360  CMP    #35, SAVE7    ; HAS LOOP TAKEN 2 MILLISECONDS
655 002224 001356          BNE    TIMLOP      ; TIME LESS THAN 2 MILLISECONDS
656 002226 012767 002242 175570  MOV    #TEST3CH, PFHAND ; SET POWER FAIL POINTER
657 002234 010667 001326      MOV    SP, SAVE      ; SAVE STACK
658 002240 000000          HALT           ; ROUTINE COMPLETE
659
660
661      ; PROGRAM RESTART ROUTINE
662
663
664

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665 002242 016706 001320 TEST3CH: MOV SAVE, SP ;RESTORE STACK
666 002246 000002 RTI ;RETURN TO TEST3
667
668
669
670
671
672 ;ROUTINE TO TEST FOR 2 MILLISECONDS OF AVERAGE INSTRUCTION TIME
673 ;ACTIVE TIME BEFORE NEXT POWER LOW FLAG.
674 ;EMT LOOP TAKES 56 MICROSECONDS
675 ;THE OPERATOR MUST TURN POWER OFF AND ON
676 ;VIGOROUSLY
677
678 002250 012706 001000 TEST4: MOV #1000, SP ;SET UP STACK
679 002254 004767 001350 JSR PC, SETSWR ;SET UP SWR POINTER
680 002260 004767 001466 JSR PC, UPDATE ;UPDATE SWR
681 002264 012706 001000 LPTST4: MOV #1000, SP ;SET UP STACK
682 002270 012767 002324 175526 MOV #TEST4A, PFHAND ;SET POINTER TO HALT
683 002276 012767 000005 175522 MOV #5, PFHAND+2 ;SET UP STATUS
684 002304 000001 WAIT ;WAIT FOR POWER FAIL
685 002306 004767 001372 TEST4E: JSR PC, PRINT ;END-OF-PASS MSG
686 002312 004650 MSG8
687 002314 005767 175656 TST SWREG ;LOOP ON TEST?
688 002320 002361 BGE LPTST4 ;YES
689 002322 000000 HALT ;HALT TEST OVER NO ERRORS
690
691
692
693 002324 022706 000774 TEST4A: CMP #774, SP ;IS STACK CORRECT
694 002330 001411 BEQ TEST4B
695 002332 010667 001230 MOV SP, SAVE ;STACK IN SAVE REG
696 002336 012767 002352 175460 MOV #HALT14E, PFHAND
697 002344 012767 000005 175454 MOV #5, PFHAND+2
698 002352 000000 HALT14E: HALT ;STACK DID NOT CONTAIN 774
699 002354 012767 002376 175442 TEST4B: MOV #TEST4CH, PFHAND ;SET UP RE-START POINTER
700 002362 012767 000005 175436 MOV #5, PFHAND+2 ;SET UP STATUS
701 002370 010667 001172 MOV SP, SAVE
702 002374 000000 HALT
703
704 ;ROUTINE TO TEST FOR 2 MILLISECONDS UP TIME (AVERAGE INSTRUCTION TIME)
705
706
707 002376 012767 002472 175420 TEST4CH: MOV #HALT15E, PFHAND ;SET UP HALT IF TRAP OCCURS BEFORE 2 MILLISECONDS
708 002404 012767 003560 175416 MOV #LRTI, EMTRP ;SET UP EMULATOR TRAP
709 002412 016706 001150 MOV SAVE, SP ;RESTORE STACK
710 002416 005067 001162 CLR SAVE7 ;ZERO SAVE 7
711 002422 104001 UPTIME: EMT+1 ;EMT TRAP (LOOP=56 MICROSEC)
712 002424 022706 000774 CMP #774, SP ;TEST STACK
713 002430 001407 BEQ TEST4D ;STACK IS CORRECT CONTINUE
714 002432 012767 002474 175364 MOV #HALT16E, PFHAND ;SET UP ERROR HALT
715 002440 012767 000000 175360 MOV #0, PFHAND+2 ;SET UP STATUS
716 002446 000001 WAIT ;WAIT FOR POWER FAIL
717 002450 062767 000001 001126 TEST4D: ADD #1, SAVE7 ;+1 COUNTER
718 002456 022767 000044 001120 CMP #36, SAVE7 ;HAS LOOP TAKEN 2 MILLISECONDS
719 002464 001356 BNE UPTIME ;NOT YET 2 MILLISECONDS
720 002466 000167 177614 JMP TEST4E ;THE POWER HAS BEEN UP FOR 2 MILLISECONDS

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721 002472 000000 HALT15E: HALT ;WE DID NOT HAVE 2 MILLISECONDS OF POWER OK
722 002474 000000 HALT16E: HALT ;STACK INCORRECT AFTER EMULATOR TRAP
723
724
725
726
727
728
729 ;MEMORY POWER ON/OFF TEST
730 ;LOAD MEMORY WITH SET DATA PATTERN
731 ;THEN COMPARE DATA FOR BIT DROP OUT OR BIT PICK UP
732 ;RE-ENTER COMPARE ROUTINE IF POWER FAIL OCCURS
733
734 ;ROUTINE TO DETERMINE THE AMOUNT OF MEMORY
735 ;ROUTINE TESTS FOR A MAX OF 28K
736
737 002476 012706 001000 TEST5: MOV #1000, SP ;SET UP STACK
738 002502 004767 001176 JSR PC, PRINT ;OUTPUT TITLE
739 002506 004352 MSG1
740 002510 004767 001114 JSR PC, SETSWR ;SET UP SWR POINTER
741 002514 004767 001232 JSR PC, UPDATE ;UPDATE SWR
742 002520 005067 001040 CLR TEMPST ;CLEAR TEMP. STORAGE
743 002524 005067 002216 CLR PINFLG ;CLEAR PWR INT FLAG
744 002530 012767 002576 175246 LPTST5: MOV #TREMST, 4 ;SET UP FOR BUS TRAP
745 002536 012767 000340 175242 MOV #340, 6 ;LOCK UP PRIORITY LEVELS
746 002544 012706 001000 MOV #1000, SP
747 002550 005067 001012 CLR SAVE ;SET UP TEST FOR 8K
748 002554 005777 001006 EXMST: TST @SAVE ;TEST MEMORY FOR AVAILABILITY
749 002560 062767 004000 001000 ADD #4000, SAVE ;SET UP TEST FOR NEXT 1K
750 002566 022767 160000 000772 CMP #160000, SAVE ;TEST FOR BUS TRAP ERROR
751 002574 001367 BNE EXMST ;TEST NEXT 4K BLOCK
752 002576 005737 000042 TREMST: TST @#42
753 002602 001407 BEQ .+20
754 002604 022737 003102 000042 CMP #LOGICAL, @#42
755 002612 001403 BEQ .+10
756 002614 162767 003000 000744 SUB #3000, SAVE
757 002622 162767 000500 000736 SUB #500, SAVE ;SET UP FOR LAST AVAILABLE BANK
758 002630 016767 000732 000724 MOV SAVE, HLIMIT ;LAST AVAILABLE MEMORY ADDRESS
759 002636 012767 000006 175140 MOV #6, 4 ;RESTORE TRAP HALT POINTER
760 002644 016767 000706 175134 MOV HLT, 6 ;RESTORE HALT.
761 002652 012767 003166 175144 MOV #TEST5A, PFHAND ;SET UP POINTER
762 002660 012706 001000 MOV #1000, SP ;SET UP STACK
763 002664 012702 004750 MOV #LLIMIT, %2 ;LOW MEMORY LIMIT
764 002670 012722 152525 FILDAT: MOV #152525, (2)+ ;LOAD DATA INTO MEMORY
765 002674 026702 000662 CMP HLIMIT, %2 ;COMPARE FOR LAST MEMEORY LOCATION
766 002700 001373 BNE FILDAT ;LOAD NEXT LOCATION
767 002702 012702 004750 CMDX: MOV #LLIMIT, %2 ;SETUP FOR COMPARE
768 002706 026702 000650 CMDAT: CMP HLIMIT, %2 ;TEST FOR LAST ADDRESS
769 002712 001103 BNE ACTMOD
770
771 ;TEST THE TTY BUFFER
772 ;FOR A CONTROL-G
773
774 002714 105737 177560 TSTB @#TKS ;CHAR IN BUFFER?
775 002720 100020 BPL 505 ;NO
776 002722 013705 177562 MOV @#TKB, %5 ;STORE CHAR
  
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777 002726 042705 177600      BIC      #177600,    %5      ;STRIP 8TH BIT
778 002732 122705 000007      CMPB     #7,      %5      ;CONTROL-G?
779 002736 001401          BEQ      40$      ;YES
780 002740 000410          BR       50$      ;NO
781 002742 016767 175230 001772 40$:  MOV     SWREG,  TEMSWR ;SAVE SWREG
782 002750 042767 040000 175220  BIC     #40000, SWREG ;ENABLE TTY PRINTING
783 002756 004767 000776          JSR     PC,      UPDAT1 ;UPDATE SWR
784 002762 105767 000576          50$:   TSTB    TEMPST   ;PWR FAIL OCCURRED?
785 002766 100016          BPL     EOP      ;NO
786 002770 032767 040000 175200  BIT     #40000, SWREG ;TTY PRINTING DISABLED?
787 002776 001026          BNE     CKACT    ;YES
788 003000 012767 000001 001740  MOV     #1,      PINFLG ;SET PWR INT FLAG
789 003006 004767 000672          JSR     PC,      PRINT  ;OUTPUT PWR FAIL MSG
790 003012 003614          MSG
791 003014 005067 001726          CLR     PINFLG   ;CLEAR PWR INT FLAG
792 003020 005067 000540          CLR     TEMPST  ;
793 003024 032767 040000 175144  EOP:   BIT     #40000, SWREG ;TTY PRINTING DISABLED?
794 003032 001010          BNE     CKACT    ;YES
795 003034 012767 000001 001704  MOV     #1,      PINFLG ;SET PWR INT FLAG
796 003042 004767 000636          JSR     PC,      PRINT  ;END-OF-PASS MSG
797 003046 004436          MSG2
798 003050 005067 001672          CLR     PINFLG   ;CLEAR PWR INT FLAG
799 003054 013700 000042          CKACT:  MOV     @#42,%0 ;
800 003060 001004          BNE     AUTO     ;BR IN AUTO MODE
801 003062 005767 175110          TST     SWREG    ;LOOP ON TEST?
802 003066 002013          BGE     LOC      ;YES
803 003070 000000          HALT          ;HALT TEST OVER NO ERRORS
804 003072 005767 000456          AUTO:   TST     FLAG  ;
805 003076 001407          BEQ     LOC      ;
806 003100 000005          RESET
807 003102 004710          LOGICAL: JSR     %7,(0)
808 003104 000240          NOP
809 003106 000240          NOP
810 003110 000240          NOP
811 003112 000137 000200          JMP     @#200
812 003116 000167 177406          LOC:   JMP     LPTST5
813 003122 022722 152525          ACTMOD: CMP     #152525,(2)+ ;TEST DATA
814 003126 001667          BEQ     CMDAT    ;COMPARE NEXT WORD
815 003130 010267 000434          MOV     %2,SAVE1 ;ADDRESS OF ERROR+2
816 003134 162767 000002 000426  SUB     #2,SAVE1  ;SUBTRACT TO CALCULATE CORRECT ADDRESS
817 003142 016700 000422          MOV     SAVE1,LIGHTS ;DATA ERROR IN THIS ADDRESS
818 003146 012767 003154 174650  MOV     #HALT18E,PFHAND ;SET UP POWER FAIL TRAP FOR ERROR
819 003154 000000          HALT18E: HALT   ;LOC DATA LIGHTS CONTAINS BAD DATA
820
821          ;FAILING ADDRESS IN DATA LIGHTS
822 003156 017700 000406          CONAD:  MOV     @SAVE1,LIGHTS ;PUT DATA IN DISPLAY LIGHTS
823 003162 000000          HALT19E: HALT   ;BAD DATA
824 003164 000650          CONAC:  BR       CMDAT    ;COMPARE NEXT WORD
825          ;ENTER THIS ROUTINE WHEN POWER FAIL OCCURS
826          ;STORE ALL ACTIVE REGISTERS THEN HALT;
827 003166 010046          TEST5A: MOV     LIGHTS,-(SP) ;SAVE LIGHTS
828 003170 010246          MOV     %2,-(SP) ;SAVE MEMORY ADDRESS
829 003172 005767 001550          TST     PINFLG   ;PWR FAIL DURING PRINTOUT?
830 003176 001053          BNE     BR1      ;YES
831 003200 022706 000770          CMP     #770,SP  ;IS STACK CORRECT
832 003204 001411          BEQ     TEST5E   ;STACK CORRECT
    
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833 003206 010667 000354      MOV      SP, SAVE      ; STACK SAVED
834 003212 012767 003226 174604  MOV      #HALT20E, PFHAND
835 003220 012767 000005 174600  MOV      #5, PFHAND+2 ; SET UP STATUS
836 003226 000000      HALT20E: HALT      ; WAIT FOR RE-START
837 003230 012767 003550 174566  TEST5E: MOV      #HALT21E, PFHAND ; SET UP FOR 2 MILLISECOND DOWN TIME ERROR
838 003236 012767 000005 174562  MOV      #5, PFHAND+2 ; AVERAGE INSTRUCTION TIME
839 003244 012767 003560 174556  MOV      #LRT1, EMTRP  ; SET UP EMULATOR TRAP
840 003252 012767 000005 174552  MOV      #5, EMTRP+2
841 003260 005067 000320      CLR      SAVE7      ; CLEAR COUNT REGISTER
842 003264 104002      MASTIM: EMT      +2      ; EXECUTE EMT
843 003266 022706 000770      CMP      #770, SP   ; IS STACK CORRECT AFTER TRAP
844 003272 001406      BEQ      XTIME     ; YES
845 003274 010667 000266      MOV      SP, SAVE
846 003300 012767 003306 174516  MOV      #HALT22E, PFHAND ; NO SET UP ERROR TRAP STACK NOT CORRECT
847 003306 000000      HALT22E: HALT    ; STACK SHOULD EQUAL 770 (SAVE REG.
848                                     ; CONTAINS CONTENTS OF STACK)
849 003310 062767 000001 000266  XTIME:  ADD      #1, SAVE7 ; ADD TO TIME COUNT
850 003316 022767 000027 000260  CMP      #23, SAVE7 ; IS TIME OK
851 003324 001357      BNE      MASTIM
852 003326 012767 003364 174470  BR1:    MOV      #TEST5CH, PFHAND ; YES SETUP RESTART ADDRESS
853 003334 012767 000005 174464  MOV      #5, PFHAND+2 ; SAVE STACK
854 003342 010667 000220      MOV      SP, SAVE
855 003346 010367 000234      MOV      %3, SAVE8 ; SAVE REGISTERS
856 003352 010467 000232      MOV      %4, SAVE9
857 003356 010567 000230      MOV      %5, SAVE10
858 003362 000000      HALT
859
860                                     ; RESTORE ACTIVE REGISTERS AND RETURN FROM INTERRUPT
861
862
863
864 003364 016706 000176      TEST5CH: MOV     SAVE, SP ; RESTORE STACK
865 003370 016703 000212      MOV     SAVE8, %3 ; RESTORE REGISTERS
866 003374 016704 000210      MOV     SAVE9, %4
867 003400 016705 000206      MOV     SAVE10, %5
868 003404 005767 001336      TST     PINFLG ; PWR FAIL DURING PRINTOUT?
869 003410 001040      BNE     BR2 ; YES
870 003412 022706 000770      CMP     #770, SP ; IS STACK CORRECT
871 003416 001404      BEQ     UPXTIM
872 003420 012767 003426 174376  MOV     #HALT23E, PFHAND ; SET UP FOR STACK ERROR TRAP
873 003426 000000      HALT23E: HALT
874 003430 012767 003552 174366  UPXTIM: MOV     #HALT24E, PFHAND ; SET UP FOR 2 MILLISECOND UP TIME ERROR
875 003436 012767 000005 174362  MOV     #5, PFHAND+2
876 003444 005067 000134      CLR     SAVE7 ; CLEAR COUNT REGISTER
877 003450 104003      EMTUP: EMT     +3 ; EXECUTE EMULATOR TRAP
878 003452 062767 000001 000124  ADD     #1, SAVE7 ; INCREMENT EMULATOR TRAP COUNT
879 003460 022706 000770      CMP     #770, SP ; IS STACK CORRECT AFTER EMT
880 003464 001406      BEQ     CNTEMT ; YES
881 003466 012767 003500 174330  MOV     #HALT25E, PFHAND ; STACK NOT CORRECT (SET UP ERROR HALT)
882 003474 010667 000066      MOV     SP, SAVE
883 003500 000000      HALT25E: HALT ; STACK DID NOT = 770 (SAVE REGISTER
884                                     ; CONTAINS CONTENTS OF STACK)
885 003502 022767 000043 000074  CNTEMT: CMP     #35, SAVE7 ; HAS POWER BEEN UP 2 MILLISECONDS
886 003510 001357      BNE     EMTUP
887 003512 012602      BR2:    MOV     (SP)+, %2 ; NO EXECUTE NEXT EMT
888 003514 012600      MOV     (SP)+, LIGHTS ; YES TIME OK
    
```

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889 003516 012767 003166 174300      MOV      #TEST5A,PFHAND ;REST ARE ACTIVE REGISTER
890 003524 012767 000005 174274      MOV      #5,PFHAND+2 ;RETURN FROM POWER FAIL TRAP
891 003532 012767 177777 000014      MOV      #177777,FLAG ;SET POWER FAIL FLAG
892 003540 152767 000200 000016      BISB    #200,TEMPST
893 003546 000002                                RTI
894 003550 000000                                HALT21E: HALT ;WE DID NOT HAVE TWO MILLISECONDS TO STORE ACTIVE REG.
895 003552 000000                                HALT24E: HALT ;POWER WAS NOT ACTIVE FOR TWO MILLISECONDS
896
897
898
899
900
901
902
903                                NOP=240
904 003554 177777                                FLAG: 177777
905 003556 000000                                HLT:     HALT
906 003560 000002                                LRTI:    RTI
907 003562 017500                                HLIMIT:  17500
908 003564 000000                                TEMPST:  0
909
910                                ;WORK REGISTERS
911 003566 000000                                SAVE:    0
912 003570 000004                                SAVE1:   4
913 003572 000000                                SAVE2:   0
914 003574 000000                                SAVE3:   0
915 003576 000000                                SAVE4:   0
916 003600 000000                                SAVE5:   0
917 003602 000000                                SAVE6:   0
918 003604 000000                                SAVE7:   0
919 003606 000000                                SAVE8:   0
920 003610 000000                                SAVE9:   0
921 003612 000000                                SAVE10:  0
922
923
924                                TKS=177560
925                                TKB=177562
926                                TPS=177564
927                                TPB=177566
928 003614 005015 053520 020122      MSG:     .ASCIZ <15><12> PWR FAIL.
929 003622 040506 046111 000
930                                .EVEN
931
932 003630 013746 000006      SETSWR:  MOV      @#6,-(SP) ;SAVE CURRENT VECTOR
933 003634 013746 000004      MOV      @#4,-(SP)
934 003640 012737 003654 000004      MOV      #15,@#4 ;SET UP TIMEOUT VECTOR
935 003646 005777 174362      TST      @SWRG ;TRY TO REFERENCE HARDWARE SWR
936 003652 000404                                BR      25 ;BR IF NO TIMEOUT OCCURS
937 003654 012767 000176 174352 15:    MOV      #SWREG,SWRG ;POINT TO SOFTWARE SWR
938 003662 022626                                CMP      (SP)+,(SP)+ ;RESTORE STACK
939 003664 012637 000004 25:    MOV      (SP)+,@#4 ;RESTORE TIMEOUT VECTOR
940 003670 012637 000006      MOV      (SP)+,@#6
941 003674 017767 174334 174274      MOV      @SWRG, SWREG ;SAVE SWR AT LOC 176
942 003702 000207                                RTS      PC
943
944 003704 032767 040000 174264      PRINT:  BIT      #40000, SWREG ;SR14 SET?
  
```


945	003712	001014			BNE	RETURN		; YES -DISABLE PRINTING
946	003714	023727	000042	003102	CMP	@#42,	#LOGICAL	; UNDER ACT?
947	003722	001410			BEQ	RETURN		; YES
948	003724	011603			MOV	(SP),	%3	; ADDRESS OF MSG AFTER JSR
949	003726	011303			MOV	(%3),	%3	; ADDRESS OF FIRST CHAR OF MSG
950	003730	105737	177564		45:	TSTB	@#TPS	; BUFFER READY?
951	003734	100375			BPL	45		; NO-LOOP
952	003736	112337	177566		MOV	(%3)+,	@#TPB	; YES-PUT MSG CHAR INTO BUFFER
953	003742	001372			BNE	45		; CONTINUE IF CHAR WAS NOT 0
954	003744	062716	000002		RETURN:	ADD	#2,	(SP)
955	003750	000207			RTS	PC		; SET UP RETURN
956	003752	016767	174220	000762	UPDATE:	MOV	SWREG,	TEMSWR
957	003760	032767	040000	174210	UPDAT1:	BIT	#40000,	SWREG
958	003766	001016			BNE	905		; YES-RETURN TO TEST
959	003770	023727	000042	003102	CMP	@#42,	#LOGICAL	; UNDER ACT?
960	003776	001412			BEQ	905		; YES-RETURN TO TEST
961	004000	004767	177700		JSR	PC,	PRINT	
962	004004	004676			MSG9			
963	004006	004767	000014		JSR	PC,	OUTPUT	; PRINT CURRENT SWR VALUE
964	004012	004767	177666		JSR	PC,	PRINT	
965	004016	004705			MSG10			
966	004020	004767	000102		JSR	PC,	INPUT	; UPDATE OR SAVE SWR
967	004024	000207			905:	RTS	PC	
968								
969								; PRINT CURRENT SWR
970								; AT THE TTY
971								
972	004026	012704	004722		OUTPUT:	MOV	#TABLE,	%4
973	004032	016714	000704			MOV	TEMSWR,	(%4)
974	004036	011467	000702		85:	MOV	(%4),	ROTATE
975	004042	042714	177770			BIC	#177770,	(%4)
976	004046	062724	000060			ADD	#60,	(%4)+
977	004052	022704	004736			CMP	#TABLE+14,	%4
978	004056	001411				BEQ	105	
979	004060	016714	000660			MOV	ROTATE,	(%4)
980	004064	000241				CLC		
981	004066	006014				ROR	(%4)	
982	004070	000241				CLC		
983	004072	006014				ROR	(%4)	
984	004074	000241				CLC		
985	004076	006014				ROR	(%4)	
986	004100	000756				BR	85	
987	004102	105737	177564		105:	TSTB	@#TPS	; PRINTER READY?
988	004106	100375				BPL	105	
989	004110	014437	177566			MOV	-(%4),	@#TPB
990	004114	022704	004722			CMP	#TABLE,	%4
991	004120	001401				BEQ	125	
992	004122	000767				BR	105	; CONTINUE
993	004124	000207			125:	RTS	PC	
994								
995								; UPDATE OR SAVE SWR
996								
997								
998	004126	005067	000606		INPUT:	CLR	CNTR	; CLEAR CHARACTER COUNTER
999	004132	005067	000600			CLR	USWREG	; CLEAR LAST UPDATED SWR
1000	004136	012704	004722			MOV	#TABLE,	%4

1001	004142	105737	177560		145:	TSTB	@#TKS		; CHAR IN BUFFER?
1002	004146	100375				BPL	145		; NO
1003	004150	013714	177562			MOV	@#TKB, (%4)		; PUT CHAR IN TABLE
1004	004154	105737	177564		165:	TSTB	@#TPS		; PRINTER READY?
1005	004160	100375				BPL	165		; NO
1006	004162	011437	177566			MOV	(%4), @#TPB		; ECHO INPUT
1007	004166	042714	177600			BIC	#177600,		(%4) ; STRIP 8TH BIT
1008	004172	122714	000015			CMPB	#15, (%4)		; CARRIAGE RETURN?
1009	004176	001417				BEQ	205		; YES
1010	004200	122714	000060			CMPB	#60, (%4)		; ILLEGAL CHAR?
1011	004204	003055				BGT	225		; YES
1012	004206	122714	000067			CMPB	#67, (%4)		; ILLEGAL CHAR?
1013	004212	002452				BLT	225		; YES
1014	004214	022767	000006	000516		CMP	#6, CNTR		; 7TH DIGIT?
1015	004222	003446				BLE	225		; YES
1016	004224	062704	000002			ADD	#2, %4		; POINT TO NEXT TABLE LOC
1017	004230	005267	000504			INC	CNTR		; INCREMENT CHARACTER COUNTER
1018	004234	000742				BR	145		; CONTINUE
1019	004236	005014			205:	CLR	(%4)		; CLEAR CR FROM TABLE
1020	004240	005767	000474			TST	CNTR		; IF NO DIGITS WERE INPUT-
1021	004244	001431				BEQ	245		; GO SAVE OLD SWR VALUE
1022	004246	012704	004722			MOV	#TABLE, %4		; POINT TO TABLE
1023	004252	042714	000060		265:	BIC	#60, (%4)		; STRIP ASCII BITS
1024	004256	062467	000454			ADD	(%4)+, USWREG		; CREATE UPDATED SWR VALUE
1025	004262	005367	000452			DEC	CNTR		; DECREMENT CHARACTER COUNTER
1026	004266	005767	000446			TST	CNTR		; LAST CHAR INPUT?
1027	004272	001412				BEQ	285		; YES
1028	004274	000241				CLC			; NO-ROTATE DIGITS
1029	004276	006167	000434			ROL	USWREG		
1030	004302	000241				CLC			
1031	004304	006167	000426			ROL	USWREG		
1032	004310	000241				CLC			
1033	004312	006167	000420			ROL	USWREG		
1034	004316	000755				BR	265		; CONTINUE
1035	004320	016767	000412	173650	285:	MOV	USWREG, SWREG		; MOVE NEW VALUE TO LOC 176
1036	004326	000207				RTS	PC		; RETURN
1037	004330	016767	000406	173640	245:	MOV	TEMSWR, SWREG		; RESTORE OLD SWR VALUE
1038	004336	000207				RTS	PC		; RETURN
1039	004340	004767	177340		225:	JSR	PC, PRINT		; REPEAT PROMPTING MSG
1040	004344	004705				MSG10			
1041	004346	000167	177554			JMP	INPUT		; BEGIN THIS ROUTINE AGAIN
1042									
1043									
1044									
1045									
1046									
1047	004352	005015	040515	047111	MSG1:	. ASCII<15><12>/MAINDEC-11-DZKAQG/			
1048	004360	042504	026503	030461					
1049	004366	042055	045532	050501					
1050	004374	107							
1051	004375	015	050012	050104		. ASCII<15><12>/PDP-11 POWER FAIL DIAGNOSTIC/<15><12>			
1052	004402	030455	020061	047520					
1053	004410	042527	020122	040506					
1054	004416	046111	042040	040511					
1055	004424	047107	051517	044524					
1056	004432	006503	000012						

1057	004436	005015	054105	051105	MSG2: .ASCIZ<15><12>/EXERCISER END OF PASS/<15><12>
1058	004444	044503	042523	020122	
1059	004452	047105	020104	043117	
1060	004460	050040	051501	006523	
1061	004466	000012			

1062	004470	005015	042524	052123	MSG3:	. ASCIZ<15><12>/TEST1 END OF PASS/<15><12>
1063	004476	020061	047105	020104		
1064	004504	043117	050040	051501		
1065	004512	006523	000012			
1066	004516	005015	042524	052123	MSG4:	. ASCIZ<15><12>/TEST2 END OF PASS/<15><12>
1067	004524	020062	047105	020104		
1068	004532	043117	050040	051501		
1069	004540	006523	000012			
1070	004544	005015	046101	042524	MSG5:	. ASCIZ<15><12>/ALTEST END OF PASS/<15><12>
1071	004552	052123	042440	042116		
1072	004560	047440	020106	040520		
1073	004566	051523	005015	000		
1074	004573	015	040412	052114	MSG6:	. ASCIZ<15><12>/ALTST1 END OF PASS/<15><12>
1075	004600	052123	020061	047105		
1076	004606	020104	043117	050040		
1077	004614	051501	006523	000012		
1078	004622	005015	042524	052123	MSG7:	. ASCIZ<15><12>/TEST3 END OF PASS/<15><12>
1079	004630	020063	047105	020104		
1080	004636	043117	050040	051501		
1081	004644	006523	000012			
1082	004650	005015	042524	052123	MSG8:	. ASCIZ<15><12>/TEST4 END OF PASS/<15><12>
1083	004656	020064	047105	020104		
1084	004664	043117	050040	051501		
1085	004672	006523	000012			
1086	004676	005015	053523	036522	MSG9:	. ASCIZ<15><12>/SWR=/ .
1087	004704	000				
1088	004705	015	005012	042516	MSG10:	. ASCIZ<15><12><12>/NEW SWR=/ .
1089	004712	020127	053523	036522		
1090	004720	000				
1091		004722				. EVEN
1092	004722	004736			TABLE:	. = +14
1093	004736	000000			USWREG:	0
1094	004740	000000			CNTR:	0
1095	004742	000000			TEMSWR:	0
1096	004744	000000			ROTATE:	0
1097	004746	000000			PINFLG:	0
1098	004750	000000			LLIMIT:	0
1099		000001			END	

START2	000210	386#	426																	
START3	000224	389#																		
START4	000230	390#																		
STATUS=	177776	393#	413*	443*	516*	562*														
STR2A	000214	387#																		
STR2B	000220	388#																		
SWREG	000176	382#	430	456	523	573	628	687	781	782*	786	793	801	937						
		941*	944	956	957	1035*	1037*													
SWRG =	000234	396#	935	937*	941															
TABLE	004722	972	977	990	1000	1022	1092#													
TEMPST	003564	742*	784	792*	892*	908#														
TEMSWR	004742	781*	956*	973	1037	1095#														
TEST1	001000	385	408#																	
TEST1C	001040	419#																		
TEST1H	001036	412	415#	419																
TEST2	001112	386	417#																	
TEST2A	001212	445	461#																	
TEST2B	001234	462	466#																	
TEST2C	001310	476	485#																	
TEST2D	001266	473	476#																	
TEST3	002036	389	619#																	
TEST3A	002112	623	638#																	
TEST3B	002142	639	644#																	
TEST3C	002242	656	665#																	
TEST3D	002210	649	653#																	
TEST4	002250	390	678#																	
TEST4A	002324	682	693#																	
TEST4B	002354	694	699#																	
TEST4C	002376	699	707#																	
TEST4D	002450	713	717#																	
TEST4E	002306	685#	720																	
TEST5	002476	384	737#																	
TEST5A	003166	761	827#	889																
TEST5C	003364	852	864#																	
TEST5E	003230	832	837#																	
TIMLOP	002162	647#	655																	
TKB =	177562	776	925#	1003																
TKS =	177560	774	924#	1001																
TPB =	177566	927#	952*	989*	1006*															
TPS =	177564	926#	950	987	1004															
TREMST	002576	744	752#																	
UPDATE	003752	410	442	515	561	621	680	741	956#											
UPDAT1	003760	783	957#																	
UPTIME	002422	711#	719																	
UPXTIM	003430	871	874#																	
USWREG	004736	999*	1024*	1029*	1031*	1033*	1035	1093#												
XTIME	003310	844	849#																	
=	004752	353#	358	364	377#	379#	381#	383#	396	398#	420	424	487	490						
		493	496	499	502	505	520	569	753	755	930#	1091#	1092#							

ABS. 004752 000

ERRORS DETECTED: 0

DZKAQG.BIN, DZKAQG.LST/CRF/SOL/NL: TOC=DZKAQG.QRC
RUN-TIME: 1 2 . 2 SECONDS
RUN-TIME RATIO: 61/3=17.1
CORE USED: 6K (11 PAGES)

