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IDENTIFICATION

PRODUCT CODE: MAINDFC-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 SWP, 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-ENARLF TTY PRINTING

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

NOTE2: SINCE THE HARDWARE SWP 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 SRI4 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 (
- 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,
ALTEST1, TEST3, AND TEST4 RESPECTIVELY.

4.3 PROGRAM AND/OR OPERATOR ACTION

THE PROGRAM TITLE IS PRINTED EACH TIME THE EXERCISER 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 RESPONSIBILITY 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 DIAGNOSTIC 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)

273 IN THIS ROUTINE THE ABILITY OF THE POWER FAIL TO TRAP AND
274 STORE ACTIVE REGISTERS, AND RESTART CORRECTLY USING A EMI TO
275 WAIT FOR THE POWER FAILURE IS TESTED HERE
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TEST 2 MILLISECONDS DOWN TIME

280 IN THIS TEST THE AMOUNT OF TIME THE PROCESSOR HAS TO STORE THE
281 ACTIVE REGISTERS IS CHECKED THIS TIME SHOULD EQUAL 2 MILLISECONDS
282 BEFORE ALL PROCESSOR ACTION MUST BE STOPPED.
283

TEST 2 MILLISECONDS UP TIME

284 IN THIS TEST THE POWER FAIL LOCK OUT OF 2 MILLISECONDS DURING
285 RE-START IS CHECKED. DURING RESTORE FOR 2 MILLISECONDS THE
286 PROCESSOR WILL NOT ALLOW A POWER FAIL TRAP TO OCCUR
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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 RECOVER-
ABLE 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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441 001116 004767 002506 JSR PC, SETSWP ;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 PCUTINE
446 001150 012706 001000 MOV #1000,SP ;SP UP STACK POINTER
447 001154 012700 152525 MOV #152525,%0 ;SET UP FAST MEMCPY
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 ;LODF 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 TEST2F ;IS STACK CORRECT
463 001220 010667 002342 MOV SP,SAVE ;CONTENTS OF STACK SAVED.
464 001224 012767 001232 176572 MOV #HALT3E,PFHAND ;STACK CONTAINS WRCMG ADDP
465 001232 000000 HALT3E: HALT
466 001234 010946 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 WRCMG
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 MEMCPY
487 001320 001401 BEQ +4 ;TEST FAST MEMCPY %5
488 001322 000000 HALT5E: HALT ;SAVE REG IN ERRCP
489 001324 022726 152525 CMP #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMCPY
490 001330 001401 BEQ +4 ;TEST FAST MEMCPY %4
491 001332 000000 HALT6E: HALT ;SAVE REG IN ERRCP
492 001334 022726 152525 CMP #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMCPY
493 001340 001401 BEQ +4 ;TEST FAST MEMCPY %3
494 001342 000000 HALT7E: HALT ;SAVE REG IN ERRCP
495 001344 022726 152525 CMP #152525,(SP)+ ;TEST SAVE REG. FOR FAST MEMCPY
496 001350 001401 BEQ +4 ;TEST FAST MEMCPY %2
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497 001352 000000 HALT8E: HALT ;SAVE REG IN ERRCP
498 001354 022726 152525 CMP #152525,(SP)+ ;TEST SAVE REG. FOR FAST MEMCPY
499 001360 001401 BEQ +4 ;TEST FAST MEMCPY %1
500 001362 000000 HALT9E: HALT ;SAVE REG IN ERRCP
501 001364 022726 152525 CMP #152525,(SP)+ ;TEST SAVE REG FOR FAST MEMCPY
502 001370 001401 BEQ +4 ;TEST FAST MEMCPY %0
503 001372 000000 HALT10E: HALT ;SAVE REG. IN ERRCP
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 WRCMG ADDK.
507 001404 000002 RTI ;RETURN FROM TRAP
508 ;
509 ;TEST ROUTINE TO CHECK RE-START CAPABILITY
510 ;USING THE PR. INSTRUCTION
511 ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
512 ;
513 001406 012706 001000 ALTEST: MOV #1000, SP ;SET UP STACK
514 001412 004767 002212 JSR PC, SETSWP ;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 ;LODF ON TEST?
524 001464 002356 BGE LPALT ;YES
525 001466 000000 HALT ;NORMAL TEST HALT NO ERRORS
526 ;
527 ;STORE ROUTINE FOR ALTEST
528 ;
529 001470 022706 000774 ALT2: CMP #774,SP ;HAS STACK BEEN PUSHED *WICE
530 001474 001406 BEQ ALT2A ;YES STACK CORRECT
531 001476 010667 002064 MOV SP,SAVE ;SAVE STACK TO INTERGATE
532 001502 012767 001510 176314 MOV #ALT2X,PFHAND ;SET UP ERROR POINTER
533 001510 000000 ALT2X: HALT ;STACK WAS PUSHED >2<
534 001512 022767 001450 177254 ALT2A: CMP #REALST,774 ;DOES STACK CONTAIN CORRECT ADDRESS
535 001520 001404 BEQ ALT2B ;STACK CONTAIN LCC PR.
536 001522 012767 001530 176274 MOV #ALT2AX,PFHAND
537 001530 000000 ALT2AX: HALT ;LOCATION 774 INCORRECT
538 001532 010667 002030 ALT2B: MOV SP,SAVE ;SAVE STACK
539 001536 012767 001554 176260 MOV #ALT2C,PFHAND ;SET UP RESTART POINTER
540 001544 012767 000005 176254 MOV #5,PFHAND+2
541 001552 000000 HALT ;END OF STORE ROUTINE
542 001554 016706 002006 ALT2C: MOV SAVE,SP ;RE-SET STACK
543 001560 002716 000002 ADD #2,(SP) ;SET NEW RETURN ADDRESS
544 001564 000002 RTI ;RETURN TO LCC (BR.)+1
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553 ;  
554 ;TEST ROUTINE TO CHECK RESTART CAPABILITY  
555 ;USING THE EMULATOR TRAP FOR A WAIT  
556 ;OPERATOR MUST SET HALT SWITCH TO ENARLE 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 LPALTI: 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 #LRTI,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 BP -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 LPALTI ;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 #LRTI,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 #LRTI,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 ;  
662 ;PROGRAM RESTART ROUTINE  
663 ;  
664 ;
```

```
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 MSG9
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 TEST4P
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 TEST4P: 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 #LRT1,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 (LCCP=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 CHECK 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 LCCP TAKEN 2 MILLISECONDS
719 002464 001356 BNE UPTIME ;NO VET 2 MILLISECONDS
720 002466 000167 177614 JMP TEST4F ;THE POWER HAS BEEN UP FOR 2 MILLISECONDS
```

```
721 002472 000000 HALT15E:HALT ;WE DID NOT HAVE 2 MILLISECONDS OF POWER ON
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 20K
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 TRMPST ;CLEAR TEMP. STORAGE
743 002524 005067 002216 CLR PINFLC ;CLEAR PWF 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 PK
748 002554 005777 001006 EXMST: TST QSAVE ;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 Q#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 000316 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 MEMORY 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 ACTWOD
770 ;
771 ;TEST THE TV BUFFER
772 ;FOR A CONTROL-G
773 ;
774 002714 105737 177560 TSTR @#TKS ;CHAR IN BUFFER?
775 002720 100020 BPL 50S ;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 ;COMTPOL-G?
779 002736 001401 BEQ 40$ ;YES
780 002740 000410 BR 50$ ;NO
781 002742 016767 175230 001772 40$: MOV SWREG, TEMSWR ;SAVE SWREG
782 002750 042767 040000 175220 BIC #40000, SWREG ;ENABLE TTY PRINTING
783 002756 004767 000776 JSR PC, UPDAT1 ;UPDATE SWR
784 002762 105767 000576 50$: TSTR 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 CRACT ;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 CLR ;
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 CRACT ;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 CLR ;
798 003050 005067 001672 CLR PINFLG ;CLEAR PWR INT FLAG
799 003054 013700 000042 CRACT: MOV #42,%0 ;
800 003060 001004 BNE AUTO ;BK IN AUTO MODE
801 003062 005767 175110 TST SWREG ;LOOP ON TEST?
802 003066 002013 BGE LOC ;YES
803 003070 000000 HALT ;HALT IFST 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 BEQ %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 ;RAD 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 CMP #770,SP ;IS STACK CORRECT
832 003204 001411 BEQ TEST5E ;STACK CORRECT
```

```
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 003550 174556 #LRTI,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,PPHAND ;REST ARE ACTIVE REGISTER
890 003524 012767 000005 174274 MOV #5,PPHAND+2 ;RETURN FROM POWER FAIL TRAP
891 003532 012767 177777 000014 MOV #177777,FLAG ;SET POWER FAIL FLAG
892 003540 152767 000200 000016 BTB #200,TEMPST
893 003546 000000 RTI
894 003550 000000 HALT21E:HALT ;WE DID NOT HAVE TWO MILLISECDS TO STCRF ACTIVE REG.
895 003552 000000 HALT24E:HALT ;POWER WAS NOT ACTIVE FOR TWO MILLISECDS
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 177560 TKS=177560
925 177562 TKB=177562
926 177564 TPS=177564
927 177566 TPB=177566
928 003614 005915 053520 020122 MSG: .ASCII <15><12>.PWP FAIL.
929 003622 040506 046111 0000 .EVEN
930 ;
931 ;
932 003630 213746 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 VECTOP
935 003646 005777 174362 @SWRG ;TRY TO REFERENCE HARDWARE SWR
936 003652 000404 TST @SWRG ;BR IF NO TIMEOUT OCCURS
937 003654 012767 000176 174352 1S: BR 2S ;POINT TO SOFTWARE SWR
938 003662 022626 MOV @SWREG,SWRG ;RESTORE STACK
939 003664 012637 000004 2S: CMP (SP)+,(SP)+ ;RESTORE TIMEOUT VECTOR
940 003670 012637 000006 MOV (SP)+,@#4
941 003674 017767 174334 174274 MOV @SWRG, SWRPG ;SAVE SWR AT LCC 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 4S: TSTP @#TPS ;PUFFER READY?
951 003734 100375 BPL 4S ;NO-LOCK
952 003736 112337 177566 MOV @#3)+, @#TPB ;YES-PUT MSG CHAR INTO BUFFER
953 003742 001372 BNE 4S ;CONTINUE IF CHAR WAS NOT 0
954 003744 062716 000002 RETURN: ADD #2, (SP) ;SET UP RETURN
955 003750 000207 RTS PC ;RETURN TO TEST
956 003752 016767 174220 000762 UPDATE: MOV SWRPG, TEMSWR ;STORE SWR VALUE
957 003760 032767 040000 174210 UPDAT1: BIT #40000, SWREG ;TTY PRINTING DISABLED?
958 003766 001016 BNE 90S ;YES-RETURN TO TEST
959 003770 023727 000042 003102 CMP @#42, #LOGICAL ;UNDER ACT?
960 003776 001412 BEQ 90S ;YES-RETURN TO TEST
961 004000 004767 177700 JSR PC, PPRINT
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 PC
968 ;
969 ;PRINT CURRENT SWR
970 ;AT THE TTY
971 ;
972 004026 012704 004722 OUTPUT: MOV #TABLE, @4 ;POINT TO TABLE
973 004032 016714 000704 MOV TEMSWR, (@4) ;MOVE SAVED SWR TO TABLE
974 004036 011467 000702 8S: MOV (@4), ROTATE ;SAVE CURRENT VALUE
975 004042 042714 177770 BIC #177770, (@4) ;CONVERT ONE ASCII CHAR
976 004046 062724 000060 ADD #60, (@4)+ ;POINT TO NEXT LCC IN TABLE
977 004052 022704 004736 CMP #TABLE+14, @4 ;IF 6TH DIGIT-
978 004056 001411 BEQ 10S ;BR
979 004060 016714 000660 MOV ROTATE, (@4) ;POINT TO NEXT CHAR
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 8S ;
987 004102 105737 177564 10S: TSTP @#TPS ;PRINTER READY?
988 004106 100375 BPL 10S ;
989 004110 014437 177566 MOV -(@4), @#TPB ;OUTPUT CHAR IN TABLE
990 004114 022704 004722 CMP #TABLE, @4 ;OUTPUT ALL CHAR IN TABLE
991 004120 001401 BEQ 12S ;
992 004122 000767 BR 10S ;CONTINUE
993 004124 000207 12S: RTS PC ;
994 ;
995 ;UPDATE OR SAVE SWR
996 ;
997 ;
998 004126 005067 000006 INPUT: CLR CNTR ;CLEAR CHARACTER COUNTER
999 004132 005067 000000 CLR USWREG ;CLEAR LAST UPDATED SWR
1000 004136 012704 004722 MOV #TABLE, @4 ;POINT TO TABLE
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DZKAQG-QRC 27-OCT-77 08:52 CROSS REFERENCE TABLE -- USER SYMPLS

SEC 0025

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)