```
                REM %
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DENTIFICATION

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
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                                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 MEMOPY 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
```

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 OUTPUUT 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,
                                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 CAPABILI ( 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 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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                                        BUT DOES NOT CHECK ANY OF THE POWERFAIL CIRCUITR"
                                        BECAUSE ACT WILL NOT POWER FAIL DURING QV


                                %


                                ;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
000000                                  =0
000005                                  REPT   5
                                        +2
                                        HALT                    ;POWER FAIL TRAPPED TO WRONG LOCATION
                                        ENDR
000024  000000                  PFHAND  0                       ;ADDRESS OF POWER FAIL HANDLER
000026  000000                          0                       ;STATUS
000072                                  REPT   72
                                        +2
                                        HALT                    ;POWER FAIL TRAPPED TO WRONG LOCATION
                                        ENDR
                                ;
                                ;
                                ;
                                ;
                                ;
                                ;400 TO 1000 IN MEMORY IS ASSIGNED TO THE STACK
                                ;
                                .
                                ;
                                ;
                                ;
000046                                  =46
000046  003102                  LOGICAL
000052                                  =52
000052  140000                          140000
000176                                  =176
000176  000000                  SWREG   0                       ;SOFTWARE SWITCH REGISTER
000200                                  .=200
000200  000167  002272          MASTER  JMP     TEST5           ;COMPLETE TEST OF POWER FAIL
```

```
                        000204  000167  000570          START1  JMP     TEST1           ;ENTER TEST 1 (TEST TRAP CAPABILITY)
                        000210  000167  000676          START2: JMP     TEST2           ;ENTER TEST2 (TEST RE-START CAPABILITY)
                        000214  000167  001166          STR2A.  JMP     ALTEST          ;TEST RE-START USING BR. INSTRUCTION
                        000220  000167  001342          STR2B   JMP     ALTST1          ;TEST RE-START USING EMT INSTRUCTION
                        000224  000167  001606          START3  JMP     TEST3           ;ENTER TEST3 (TEST FOR 2 MILLISECONDS TIME) DOWN TIME
                        000230  000167  002014          START4: JMP     TEST4           ;ENTER TEST4 (TEST FOR TWO MILLISECONDS) UP TIME
                                000006                  SP=%6                           ;STACK
                                000000                  LIGHTS=%0                       ;DATA LIGHTS
                                177776                  STATUS=177776                   ;LOCATION OF STATUS REGISTER
                                000007                  PC=%7                           ;LOCATION OF PC
                                000030                  EMTRP=30                        ;EMULATOR TRAP LOCATION
                                000234                  SWRG=
                        000234  177570                          WORD    177570
                                001000                          =1000
                                                        ;
                                                        ;BASIC POWER FAIL TEST
                                                        ;
                                                        ;TEST1 IS A ROUTINE USED TO THE POWER FAIL'S ABILITY
                                                        ;TO TRAP TO LOCATION 24
                                                        ;
                                                        ;OPERATOR INSTRUCTIONS
                                                        ;
                                                        ;
                        001000  012706  001000          TEST1   MOV     #1000, SP       ;SET UP STACK
                        001004  004767  002620                  JSR     PC,     SETSWR  ;SET UP SWR POINTER
                        001010  004767  002736                  JSR     PC,     UPDATE  ;UPDATE SWR
                        001014  012706  001000          LPTST1  MOV     #1000,SP        ;SET UP STACK
                        001020  012767  001036  176776          MOV     #TEST1H,PFHAND  ;SET UP POINTER
                        001026  052767  000357  176742          BIS     #357,STATUS     ;SET STATUS BITS
                        001034  000001                          WAIT                    ;WAIT FOR POWER FAIL OPERATOR SHOULD TURN OFF HERE
                        001036  000000          TEST1H. HALT                            ;POWER FAIL HALTS HERE ON WAY DOWN
                                                        ;
                                                        ;TEST1 CHECK - CHECK IF STACK WAS DECREMENTED AND
                                                        ;STATUS WAS SET UP
                        001040  026727  177730  001036  TEST1CH          CMP     774,#TEST1H     ;CHECK PC AND SP (LOCATION)
                        001046  001401                          BEQ     .+4             ;ARE THEY EQUAL
                        001050  000000          HALT1   HALT                            ;ERROR! PROCESSOR FAILED TO TRAP
                                                                                        ;LOCATION 774 SHOULD CONTAIN #TEST1H IN STACK
                        001052  026727  177720  000357          CMP     776,#357        ;WAS THE STATUS STORED CORRECTLY
                        001060  001401                          BEQ      +4             ;TEST
                        001062  000000          HALT2   HALT                            ;ERROR THE STATUS BEFORE THE TRAP WAS NOT STORED
                        001064  012700  000210          MOV     #START2,LIGHTS  ;SET UP LIGHTS WITH ADDRESS
                        001070  012706  001000          MOV     #1000,  SP      ;SET UP STACK
                        001074  004767  002604          JSR     PC,     PRINT   ;END-OF-PASS MSG
                        001100  004470                  MSG3
                        001102  005767  177070          TST     SWREG           ;LOOP ON TEST?
                        001106  002342                  BGE     LPTST1          ;YES
                        001110  000000                  HALT                    ;NORMAL HALT NO ERRORS

                                                        ;
                                                        ;TEST ROUTINE TO CHECK RE-START CAPABILITY
                                                        ;USING THE WAIT INSTRUCTION
                                                        ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
                                                        ;
                                                        ;
                        001112  012706  001000          TEST2   MOV     #1000,  SP      ;SET UP STACK
```

```
  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  001000              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 FA L 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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                                        HALT8E  HALT                    ;SAVE REG IN ERROR
                                                CMP     #152525,(SP)+   ;TEST SAVE REG. FOR FAST MEMORY
                                                BEQ     .+4             ;TEST FAST MEMORY %1
                                        HALT9E. HALT                    ;SAVE REG IN ERROR
                                                CMP     #152525,(SP)+   ;TEST FAST MEMORY %0
                                                BEQ     .+4
                                        HALT10E:        HALT            ;SAVE REG. IN ERROR
                                                CMP     #774,SP         ;TEST STACK FOR CORRECT ADDR
                                                BEQ      +4             ;STACK SHOULD HAVE 2 WORDS
                                        HALT11E         HALT            ;STACK HAS WRONG ADDR
                                                RTI                     ;RETURN FROM TRAP
                                        ;
                                        ;TEST ROUTINE TO CHECK RE-START CAPABILITY
                                        ;USING THE BR  INSTRUCTION
                                        ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
                                        ;
                                        ALTEST: MOV     #1000,  SP              ;SET UP STACK
                                                JSR     PC,     SETSWR  ;SET UP SWR POINTER
                                                JSR     PC,     UPDATE  ;UPDATE SWR
                                        LPALT   MOV     #357,STATUS     ;SET UP CONDITION CODES
                                                MOV     #5,PFHAND+2     ;SET UP POWER FAIL CODES
                                                MOV     #ALT2,PFHAND    ;SET UP POWER DOWN POINTER
                                                MOV     #1000,SP        ;SET UP STACK
                                        REALST: BR                      ;WAIT FOR POWER FAIL
                                                JSR     PC,     PRINT   ;END-OF-PASS MSG
                                                MSG5
                                                TST     SWREG           ;LOOP ON TEST?
                                                BGE     LPALT           ;YES
                                                HALT                    ;NORMAL TEST HALT NO ERRORS
                                        ;
                                        ;STORE ROUTINE FOR ALTEST
                                        ;
                                        ALT2    CMP     #774,SP         ;HAS STACK BEEN PUSHED TWICE
                                                BEQ     ALT2A           ;YES STACK CORRECT
                                                MOV     SP,SAVE         ;SAVE STACK TO INTERAGATE
                                                MOV     #ALT2X,PFHAND   ;SET UP ERROR POINTER
                                        ALT2X   HALT                    ;STACK WAS PUSHED >2<
                                        ALT2A   CMP     #REALST,774     ;DOES STACK CONTAIN CORRECT ADDRESS
                                                BEQ     ALT2B           ;STACK CONTAIN LOC BR
                                                MOV     #ALT2AX,PFHAND
                                        ALT2AX: HALT                    ;LOCATION 774 INCORPECT
                                        ALT2B   MOV     SP,SAVE         ;SAVE STACK
                                                MOV     #ALT2C,PFHAND   ;SET UP RESTART POINTER
                                                MOV     #5,PFHAND+2
                                                HALT                    ;END OF STORE ROUTINE
                                        ALT2C   MOV     SAVE,SP         ;RE-SET STACK
                                                ADD     #2,(SP)         ;SET NEW RETURN ADDRESS
                                                RTI                     ;RETURN TO LOC (BP )+1
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
```

```
                                        ;
                                        ;TEST ROUTINE TO CHECK RESTART CAPABILITY
                                        ;USING THE EMULATOR TRAP FOR A WAIT
                                        ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
                                        ;
001566  012706  001000        ALTST1: MOV     #1000, SP       ;SET UP STACK
001572  004767  002032                JSR     PC,    SETSWR   ;SET UP SWR POINTER
001576  004767  002150                JSR     PC,    UPDATE   ;UPDATE SWR
001602  012767  000357  176166 LPALT1: MOV#357,STATUS  ;SET UP CONDITION CODES
001610  012767  000005  176210        MOV     #5,PFHAND+2     ;SET UP POWER FAIL CODES
001616  012767  001674  176200        MOV     #ALT3A,PFHAND   ;SET UP POWER DOWN POINTER
001624  012706  001000                MOV     #1000,SP
001630  012767  003560  176172        MOV     #LRTI,EMTRP     ;SET UP EMT TRAP
001636  012767  000005  176166        MOV     #5,EMTRP+2
001644  104002        EMTWT   EMT     +2              ;EMULATOR TRAP
001646  000776                BR      .-2
001650  016767  001730  176152 ALTST2: MOV     SAVE7,EMTRP
001656  004767  002022                JSR     PC,    PRINT    ;END-OF-PASS MSG
001662  004573                        MSG6
001664  005767  176306                TST     SWREG           ;LOOP ON TEST?
001670  002344                        BGE     LPALT1          ;YES
001672  000000                        HALT                    ;NORMAL HALT NO ERRORS
                                        ;
                                        ;ROUTINE TO STORE ACTIVE REGISTERS
                                        ;POWER DOWN
                                        ;
001674  016767  176130  001702 ALT3A   MOV       TRP SAVE7     ;SAVE EMULATOR TRAP
001702  012767  002034  176120        M                 EMTRP ;SET UP ERROR HALT
001710  022706  000774                                        ;HAS STACK BEEN PUSHED TWICE
001714  001414
001716  022706  000770                                        ;HAS STACK BEEN PUSHED 4 TIMES
001722  001411
001724  012767  001744  176072 ALT3B          - L 3BA,PFHAND ;SET UP POWER FAIL POINTER
001732  012767  000005  176066                #5,PFHAND+2
001740  010667  001622                MOV     SP,SAVE         ;SAVE STACK
001744  000000        ALT3BX. HALT                            ;STACK INCORRECT (STACK PUSHED LESS THAN 2 OR MORE THAN
001746  012767  001770  176050 ALT3C   MOV     #ALT3D,PFHAND   ;SET UP RE-START POINTER
001754  012767  000005  176044        MOV     #5,PFHAND+2     ;SET UP NEW STATUS
001762  010667  001600                MOV     SP,SAVE
001766  000000                        HALT                    ;END OF STORE ROUTINE
                                        ;ROUTINE TO TEST POWER UP SEQUENCE
                                        ;
                                        ;
001770  016706  001572 ALT3D   MOV     SAVE,SP         ;RESTORE STACK
001774  022706  000774                CMP     #774,SP         ;WAS STACK PUSHED ONLY TWICE
002000  001723                        BEQ     ALTST2          ;
002002  022706  000770                CMP     #770,SP         ;ARE WE DOING AN EMT
002006  001403                        BEQ     ALT3E
002010  010667  001552                MOV     SP,SAVE         ;STACK IN SAVE REG
002014  000000                        HALT                    ;STACK INCORRECT
002016  022767  003560  176744 ALT3E   CMP     #LRTI,770       ;DOES STACK CONTAIN CORRECT INFO
002024  001711                        BEQ     ALTST2          ;YES EXIT
002026  011667  001534                MOV     (SP),SAVE
002032  000000                        HALT                    ;STACK CONTAINS WRONG ADDRESS
                                        .
```

```
                                        ;
                                        ;
002034  000000                         ALT3X.  HALT                    ;EMT ACTIVE INSTEAD OF POWER FAIL ON POWER DOWN
                                                                        ;EMT ACTIVE ON RESTART INSTEAD OF POWER FAIL
                                        ;
                                        ;ROUTINE TO CHECK TWO MILLISECOND STORE TIME
                                        ;AVERAGE INSTRUCTION TIME
                                        ;ROUTINE WAITS FOR SHUT DOWN IN EMT LOOP
                                        ;
002036  012706  001000                 TEST3.  MOV     #1000, SP       ;SET UP STACK
002042  004767  001562                         JSR     PC,    SETSWR   ;SET UP SWR POINTER
002046  004767  001700                         JSR     PC,    UPDATE   ;UPDATE SWR
002052  012706  001000                 LPTST3  MOV     #1000,SP        ;SET UP STACK
002056  012767  002112  175740                 MOV     #TEST3A,PFHAND  ;SET UP POWER FAIL STORE POINTER
002064  012767  000005  175734                 MOV     #5,PFHAND+2     ;SET UP STATUS
002072  000001                               WAIT                    ;WAIT FOR INTERRUPT
002074  004767  001604                         JSR     PC,    PRINT    ;END-OF-PASS MSG
002100  004622                               MSG7
002102  005767  176C70                       TST     SWREG           ;LOOP ON TEST?
002106  002361                               BGE     LPTST3          ;YES
002110  000000                               HALT                    ;NORMAL TEST HALT NO ERRORS
                                                                        ;LOOP ON TEST
                                                                        ;RESTART PROGRAM
                                        ;OPERATOR MUST TURN POWER OFF AND ON HERE
                                        ;
                                        ;TEST FOR 2 MILLISECONDS OF AVERAGE INSTRUCTION TIME
                                        ;TIME OF LOOP 57 4 MICROSECONDS
002112  022706  000774                 TEST3A  CMP     #774,SP         ;IS STACK CORRECT
002116  001411                               BEQ     TEST3B          ;STACKER IS CORRECT
002120  010667  001442                       MOV     SP,SAVE         ;CONTENTS OF STACK IN SAVE REG
002124  012767  002140  175672               MOV     #HALT12E,PFHAND ;SETUP ERROR HALT
002132  012767  000000  175666               MOV     #0,PFHAND+2     ;SETUP STATUS WORD
002140  000000                         HALT12E.HALT                    ;WAIT FOR RE-START
002142  012767  003560  175660         TEST3B  MOV     #LRTI,EMTRP     ;SET UP EMULATOR TRAP
002150  012767  000005  175654                 MOV     #5,EMTRP+2      ;SET UP EMULATOR STATUS
002156  005067  001422                       CLR     SAVE7           ;SET COUNT TO ZERO
002162  104000                         TIMLOP: EMT+0                   ;EMT TRAP (EMT LOOP=57 4 MICROSEC)
002164  022706  000774                       CMP     #774,SP         ;IS STACK CORRECT AFTER EMT
002170  001407                               BEQ     TEST3D          ;STACK CORRECT CONTINUE
002172  012767  002206  175624               MOV     #HALT13E,PFHAND ;SETUP ERROR HALT
002200  012767  000000  175620               MOV     #0,PFHAND+2     ;SETUP STATUS
002206  000000                         HALT13E:HALT                    ;WAIT FOR RE-START
002210  062767  000001  001366         TEST3D  ADD     #1,SAVE7        ;+1 COUNT
002216  022767  000043  001360               CMP     #35.,SAVE7      ;HAS LOOP TAKEN 2 MILLISECONDS
002224  001356                               BNE     TIMLOP          ;TIME LESS THAN 2 MILLISECONDS
002226  012767  002242  175570               MOV     #TEST3CH,PFHAND ;SET POWER FAIL POINTER
002234  010667  001326                       MOV     SP,SAVE         ;SAVE STACK
002240  000000                               HALT                    ;ROUTINE COMPLETE


                                        ;
                                        ;PROGRAM RESTART ROUTINE
                                        ;
                                        .
```

```
  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 INSTPUCTION 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
```

```
   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 ADDPESS
   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     50$             ;NO
   776  002722  013705  177562                  MOV     @#TKB,  %5      ;STORE CHAR
```

```
  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        ,SUBTPACT 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 OCCURRS
  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 PPINTOUT?
  830  003176  001053                            BNE     BR1             ,YES
  831  003200  022706  000770                    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 INSRUCTION TIME
 839  003244  012767  003560  174556      MOV     #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
```

```
  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          000240                   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  005015  053520  020122  MSG     ASCIZ   <15><12>PWR FAIL
  929  003622  040506  046111     000
  930          003630                   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     #1$,@#4                 ;SET UP TIMEOUT VECTOR
  935  003646  005777  174362                  TST     @SWRG                   ;TRY TO REFERENCE HARDWARE SWR
  936  003652  000404                          BR      2$                      ;BR IF NO TIMEOUT OCCURS
  937  003654  012767  000176  174352  1$      MOV     #SWREG,SWRG             ;POINT TO SOFTWARE SWR
  938  003662  022626                          CMP     (SP)+,(SP)+             ;RESTORE STACK
  939  003664  012637  000004          2$      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          4$:   TSTB    @#TPS           ;BUFFER READY?
  951  003734  100375                        BPL     4$              ;NO-LOOP
  952  003736  112337  177566                MOVB    (%3)+,  @#TPB   ,YES-PUT MSG CHAR INTO BUFFER
  953  003742  001372                        BNE     4$              ;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     SWREG,  TEMSWR  ;STORE SWR VALUE
  957  003760  032767  040000  174210  UPDAT1  BIT     #40000, SWREG   ,TTY PRINTING DISABLED?
  958  003766  001016                        BNE     90$             ,YES-RETURN TO TEST
  959  003770  023727  000042  003102        CMP     @#42,   #LOGICAL        ;UNDER ACT?
  960  003776  001412                        BEQ     90$             ,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                  90$   RTS     PC
  968                                                                  ,
  969                                                                  ,PRINT CUPRENT 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          8$      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 LOC IN TABLE
  977  004052  022704  004736                  CMP     #TABLE+14,      %4      ,IF 6TH DIGIT-
  978  004056  001411                        BEQ     10$             ,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      8$
  987  004102  105737  177564          10$   TSTB    @#TPS           ;PRINTER READY?
  988  004106  100375                        BPL     10$             ,
  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     12$             ,
  992  004122  000767                        BR      10$             ,CONTINUE
  993  004124  000207                  12$   RTS     PC              ,
  994                                                                  ,
  995                                                                  ,UPDATE OR SAVE SWP
  996                                                                  ,
  997                                                                  ,
  998  004126  005067  000606          INPUT   CLR     CNTR            ,CLEAR CHARACTER COUNTER
  999  004132  005067  000600                  CLR     USWREG                  ,CLEAR LAST UPDATED SWP
 1000  004136  012704  004722                MOV     #TABLE, %4      ,POINT TO TABLE
```

```
 1001  004142  105737  177560          14$     TSTB    @#TKS           ,CHAR IN BUFFER?
 1002  004146  100375                          BPL     14$             ,NO
 1003  004150  013714  177562                  MOV     @#TKB,  (%4)    ,PUT CHAR IN TABLE
 1004  004154  105737  177564          16$     TSTB    @#TPS           ,PRINTER READY?
 1005  004160  100375                          BPL     16$             ;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     20$             ;YES
 1010  004200  122714  000060                  CMPB    #60,    (%4)    ;ILLEGAL CHAR?
 1011  004204  003055                          BGT     22$             ;YES
 1012  004206  122714  000067                  CMPB    #67,    (%4)    ,ILLEGAL CHAR?
 1013  004212  002452                          BLT     22$             ,YES
 1014  004214  022767  000006  000516          CMP     #6,     CNTR    ,7TH DIGIT?
 1015  004222  003446                          BLE     22$             ,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      14$             ,CONTINUE
 1019  004236  005014                  20$     CLR     (%4)            ,CLEAR CR FROM TABLE
 1020  004240  005767  000474                  TST     CNTR            ,IF NO DIGITS WERE INPUT-
 1021  004244  001431                          BEQ     24$             ,GO SAVE OLD SWR VALUE
 1022  004246  012704  004722                  MOV     #TABLE, %4              ,POINT TO TABLE
 1023  004252  042714  000060          26$     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     28$             ;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      26$             ,CONTINUE
 1035  004320  016767  000412  173650  28$     MOV     USWREG, SWREG   ,MOVE NEW VALUE TO LOC 176
 1036  004326  000207                          RTS     PC              ,RETURN
 1037  004330  016767  000406  173640  24$     MOV     TEMSWR, SWREG   ;RESTORE OLD SWR VALUE
 1038  004336  000207                          RTS     PC              ,RETURN
 1039  004340  004767  177340          22$     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          ASCIZ<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
```

SEQ 0020

```
  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
```

```
ACTMOD  003122            769     813#
ALTEST  001406            387     513#
ALTST1  001566            388     559#
ALTST2  001650            570#    599     605
ALT2    001470            518     529#
ALT2A   001512            530     534#
ALT2AX  001530            536     537#
ALT2B   001532            535     538#
ALT2C   001554            539     542#
ALT2X   001510            532     533#
ALT3A   001674            564     580#
ALT3B   001724            586#
ALT3BX  001744            586     589#
ALT3C   001746            583     585     590#
ALT3D   001770            590     597#
ALT3E   002016            601     604#
ALT3X   002034            581     611#
AUTO    003072            800     804#
BR1     003326            830     852#
BR2     003512            869     887#
CKACT   003054            787     794     799#
CMDAT   002706            768#    814     824
CMDX    002702            767#
CNTEMT  003502            880     885#
CNTR    004740            998*   1014    1017*   1020    1025*   1026    1094#
CONAC   003164            824#
CONAD   003156            822#
EMTRP = 000030            395#    566*    567*    570*    580     581*    644*    645*    708*    839*    840*
EMTUP   003450            877#    886
EMTWT   001644            568#
EOP     003024            785     793#
EXMST   002554            748#    751
FILOUT  002670            764#    766
FLAG    003554            804     891*    904#
HALT1   001050            421#
HALT10  001372            503#
HALT11  001402            506#
HALT12  002140            641     643#
HALT13  002206            650     652#
HALT14  002352            696     698#
HALT15  002472            707     721#
HALT16  002474            714     722#
HALT18  003154            818     819#
HALT19  003162            823#
HALT2   001062            425#
HALT20  003226            834     836#
HALT21  003550            837     894#
HALT22  003306            846     847#
HALT23  003426            872     873#
HALT24  003552            874     895#
HALT25  003500            881     883#
HALT3E  001232            464     465#
HALT4E  001264            474     475#
HALT5E  001322            488#
HALT6E  001332            491#
HALT7E  001342            494#
```

```
HALT8E  001352  497#
HALT9E  001362  500#
HLIMIT  003562  758*  765  768  907#
HLT     003556  760  905#
INPUT   004126  966  998#  1041
LLIMIT  004750  763  767  1098#
LOC     003116  802  805  812#
LOGICA  003102  378  754  807#  946  959
LPALT   001422  516#  524
LPALT1  001602  562#  574
LPTST1  001014  411#  431
LPTST2  001126  443#  457
LPTST3  002052  622#  629
LPTST4  002264  681#  688
LPTST5  002530  744#  812
LRTI    003560  566  604  644  708  839  906#
MASTER  000200  384#
MASTIM  003264  842#  851
MSG     003614  790  928#
MSG1    004352  739  1047#
MSG10   004705  965  1040  1088#
MSG2    004436  797  1057#
MSG3    004470  429  1062#
MSG4    004516  455  1066#
MSG5    004544  522  1070#
MSG6    004573  572  1074#
MSG7    004622  627  1078#
MSG8    004650  686  1082#
MSG9    004676  962  1086#
NOP   = 000240  903#
OUTPUT  004026  963  972#
PFHAND  000024  358#  412*  444*  445*  464*  474*  476*  477*  517*  518*  532*  536*  539*
                540*  563*  564*  586*  587*  590*  591*  623*  624*  641*  642*  650*  651*
                656*  682*  683*  696*  697*  699*  700*  707*  714*  715*  761*  818*  834*
                835*  837*  838*  846*  852*  853*  872*  874*  875*  881*  889*  890*
PINFLG  004746  743*  788*  791*  795*  798*  829  868  1097#
PRINT   003704  428  454  521  571  626  685  738  789  796  944#  961  964  1039
REALST  001450  520#  534
RETURN  003744  945  947  954#
ROTATE  004744  974*  979  1096#
SAVE    003566  463*  478*  485  531*  538*  542  588*  592*  597  602*  606*  640*  657*
                665  695*  701*  709  747*  748  749*  750  756*  757*  758  833*  845*
                854*  864  882*  911#
SAVE1   003570  815*  816*  817  822  912#
SAVE10  003612  857*  867  921#
SAVE2   003572  913#
SAVE3   003574  914#
SAVE4   003576  915#
SAVE5   003600  916#
SAVE6   003602  917#
SAVE7   003604  570  580*  646*  653*  654  710*  717*  718  841*  849*  850  876*  878*
                885  918#
SAVE8   003606  855*  865  919#
SAVE9   003610  856*  866  920#
SETSWR  003630  409  441  514  560  620  679  740  932#
START1  000204  385#
```

```
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#
TEMSWP  004742            781*    956*    973     1037    1095#
TEST1   001000            385     408#
TEST1C  001040            419#
TEST1H  001036            412     415#    419
TEST2   001112            386     [illegible]
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)
```