```
                        .REM %

                                        IDENTIFICATION

                                PRODUCT CODE: AC 8814H-MC

                                PRODUCT NAME: CZKAQHO POWER FAIL DIAG

                                DATE RELEASED: JULY 1985

                                MAINTAINER: DIAGNOSTIC ENGINEERING


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                                1.      ABSTRACT
                                        --- -

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

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

                                2.      REQUIREMENTS
                                        -- - ----

                                2.1     EQUIPMENT
                                        ---------

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

                                2.2     STORAGE
                                        -------

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

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


                                3.      LOADING PROCEDURE
                                        ---------------

                                3.1     METHOD
                                        ------

                                        PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

                                4.      STARTING PROCEDURE
                                        ------------------

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

                                4.1     SWITCH SETTING
                                        ------ -------

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

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.

```
                                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-
```

```
                                        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)
                                        ------ --------- ---- - -- ---------
```

```
                                        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
```

```
                                        BUT DOES NOT CHECK ANY OF THE POWERFAIL CIRCUITRY
                                        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  003340                          LOGICAL
000052                                  .=52
000052  140000                          140000
000176                                  .=176
000176  000000                  SWREG:  0               ;SOFTWARE SWITCH REGISTER
000200                                  .=200
000200  000167  002530          MASTER: JMP     TESTS           ;COMPLETE TEST OF POWER FAIL
```

```
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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  002136          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
        000007                  MFPT=000007
        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  003056          JSR     PC,     SETSWR  ;SET UP SWR POINTER
001010  004767  003174          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  003042          JSR     PC,     PRINT   ;END-OF-PASS MSG
001100  004726                  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
                                ;
                                ;
```

```
  437  001112  012706  001000          TEST2:  MOV     #1000,  SP      ;SET UP STACK
  438  001116  004767  002744                  JSR     PC,     SETSWR  ;SET UP SWR POINTER
  439  001122  004767  003062                  JSR     PC,     UPDATE  ;UPDATE SWR
  440  001126  012767  000357  176642  LPTST2: MOV     #357,STATUS     ;SET UP CONDITION CODES
  441  001134  012767  000005  176664          MOV     #5,PFHAND+2     ;SET UP POWER FAIL CODES
  442  001142  012767  001212  176654          MOV     #TEST2A,PFHAND  ;SET UP POINTER TO STORE ROUTINE
  443  001150  012706  001000                  MOV     #1000,SP        ;SP UP STACK POINTER
  444  001154  012700  152525                  MOV     #152525,%0      ;SET UP FAST MEMORY
  445  001160  010001                          MOV     %0,%1
  446  001162  010102                          MOV     %1,%2
  447  001164  010203                          MOV     %2,%3
  448  001166  010304                          MOV     %3,%4
  449  001170  010405                          MOV     %4,%5
  450  001172  000001                          WAIT                    ;WAIT FOR POWER FAIL TRAP
  451  001174  004767  002742                  JSR     PC,     PRINT   ;END-OF-PASS MSG
  452  001200  004754                          MSG4
  453  001202  005767  176770                  TST     SWREG           ;LOOP ON TEST?
  454  001206  002347                          BGE     LPTST2          ;YES
  455  001210  000000                          HALT                    ;NORMAL TEST HALT NO ERRORS
  456                                   ;OPERATOR MUST TURN POWER OFF HERE
  457                                   ;ROUTINE TO STORE ACTIVE REG.
  458  001212  022706  000774          TEST2A: CMP     #774,SP         ;IS STACK CORRECT
  459  001216  001406                          BEQ     TEST2B
  460  001220  010667  002600                  MOV     SP,SAVE         ;CONTENTS OF STACK SAVED.
  461  001224  012767  001232  176572          MOV     #HALT3E,PFHAND  ;STACK CONTAINS WRONG ADDR
  462  001232  000000                  HALT3E: HALT
  463  001234  010046                  TEST2B: MOV     %0,-(SP)        ;STORE REG 0
  464  001236  010146                          MOV     %1,-(SP)        ;STORE REG 1
  465  001240  010246                          MOV     %2,-(SP)        ;STORE REG 2
  466  001242  010346                          MOV     %3,-(SP)        ;STORE REG 3
  467  001244  010446                          MOV     %4,-(SP)        ;STORE REG 4
  468  001246  010546                          MOV     %5,-(SP)        ;STORE REG RE STACK
  469  001250  022706  000760                  CMP     #760,SP         ;IS STACK CORRECT
  470  001254  001404                          BEQ     TEST2D
  471  001256  012767  001264  176540          MOV     #HALT4E,PFHAND  ;THE STACK IS WRONG
  472  001264  000000                  HALT4E: HALT                    ;WAIT FOR RESTART
  473  001266  012767  001310  176530  TEST2D: MOV     #TEST2CH,PFHAND ;SET UP NEW POINTER
  474  001274  012767  000005  176524          MOV     #5,PFHAND+2
  475  001302  010667  002516                  MOV     SP,SAVE
  476  001306  000000                          HALT                    ;ALL ACTIVE REG. STORED. WAIT FOR RESTART.
  477                                   ;
  478                                   ;OPERATOR MUST TURN POWER ON HERE
  479                                   ;ROUTINE TO RE-STORE ACTIVE REGISTER AFTER RE-START.
  480                                   ;
  481
  482  001310  016706  002510  TEST2CH:         MOV     SAVE,SP
  483  001314  022726  152525                  CMP     #152525,(SP)+   ;TEST SAVE REG FOR FAST MEMORY
  484  001320  001401                          BEQ     .+4             ;TEST FAST MEMORY %5
  485  001322  000000                  HALT5E: HALT                    ;SAVE REG IN ERROR
  486  001324  022726  152525                  CMP     #152525,(SP)+   ;TEST SAVE REG FOR FAST MEMORY
  487  001330  001401                          BEQ     .+4             ;TEST FAST MEMORY %4
  488  001332  000000                  HALT6E: HALT                    ;SAVE REG IN ERROR
  489  001334  022726  152525                  CMP     #152525,(SP)+   ;TEST SAVE REG FOR FAST MEMORY
  490  001340  001401                          BEQ     .+4             ;TEST FAST MEMORY %3
  491  001342  000000                  HALT7E: HALT                    ;SAVE REG IN ERROR
  492  001344  022726  152525                  CMP     #152525,(SP)+   ;TEST SAVE REG. FOR FAST MEMORY
```

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   493  001350  001401                        BEQ     .+4                ;TEST FAST MEMORY #2
   494  001352  000000                HALT8E: HALT                       ;SAVE REG IN ERROR
   495  001354  022726  152525                CMP     #152525,(SP)+      ;TEST SAVE REG. FOR FAST MEMORY
   496  001360  001401                        BEQ     .+4                ;TEST FAST MEMORY #1
   497  001362  000000                HALT9E: HALT                       ;SAVE REG IN ERROR
   498  001364  022726  152525                CMP     #152525,(SP)+      ;TEST FAST MEMORY #0
   499  001370  001401                        BEQ     .+4
   500  001372  000000                HALT10E:        HALT               ;SAVE REG. IN ERROR
   501  001374  022706  000774                CMP     #774,SP            ;TEST STACK FOR CORRECT ADDR.
   502  001400  001401                        BEQ     .+4                ;STACK SHOULD HAVE 2 WORDS.
   503  001402  000000                HALT11E:        HALT               ;STACK HAS WRONG ADDR.
   504  001404  000002                        RTI                        ;RETURN FROM TRAP
   505                                    ;
   506                                    ;TEST ROUTINE TO CHECK RE-START CAPABILITY
   507                                    ;USING THE BR. INSTRUCTION
   508                                    ;OPERATOR MUST SET HALT SWITCH TO ENABLE POSITION
   509                                    ;
   510  001406  012706  001000            ALTEST: MOV     #1000,  SP                 ;SET UP STACK
   511  001412  004767  002450                    JSR     PC,     SETSWR     ;SET UP SWR POINTER
   512  001416  004767  002566                    JSR     PC,     UPDATE     ;UPDATE SWR
   513  001422  012767  000357  176346    LPALT:  MOV     #357,STATUS        ;SET UP CONDITION CODES
   514  001430  012767  000005  176370            MOV     #5,PFHAND+2        ;SET UP POWER FAIL CODES
   515  001436  012767  001470  176360            MOV     #ALT2,PFHAND       ;SET UP POWER DOWN POINTER
   516  001444  012706  001000                    MOV     #1000,SP           ;SET UP STACK
   517  001450  000777                REALST: BR      .                  ;WAIT FOR POWER FAIL
   518  001452  004767  002464                    JSR     PC,     PRINT      ;END-OF-PASS MSG
   519  001456  005002                            MSG5
   520  001460  005767  176512                    TST     SWREG              ;LOOP ON TEST?
   521  001464  002356                            BGE     LPALT              ;YES
   522  001466  000000                            HALT                       ;NORMAL TEST HALT NO ERRORS
   523                                    ;
   524                                    ;STORE ROUTINE FOR ALTEST
   525                                    ;
   526  001470  022706  000774            ALT2:   CMP     #774,SP            ;HAS STACK BEEN PUSHED TWICE
   527  001474  001406                            BEQ     ALT2A              ;YES STACK CORRECT
   528  001476  010667  002322                    MOV     SP,SAVE            ;SAVE STACK TO INTERAGATE
   529  001502  012767  001510  176314            MOV     #ALT2X,PFHAND      ;SET UP ERROR POINTER
   530  001510  000000                ALT2X:  HALT                       ;STACK WAS PUSHED >2<
   531  001512  022767  001450  177254    ALT2A:  CMP     #REALST,774        ;DOES STACK CONTAIN CORRECT ADDRESS
   532  001520  001404                            BEQ     ALT2B              ;STACK CONTAIN LOC BR.
   533  001522  012767  001530  176274            MOV     #ALT2AX,PFHAND
   534  001530  000000                ALT2AX: HALT                       ;LOCATION 774 INCORRECT
   535  001532  010667  002266            ALT2B:  MOV     SP,SAVE            ;SAVE STACK
   536  001536  012767  001554  176260            MOV     #ALT2C,PFHAND      ;SET UP RESTART POINTER
   537  001544  012767  000005  176254            MOV     #5,PFHAND+2
   538  001552  000000                            HALT                       ;END OF STORE ROUTINE
   539  001554  016706  002244            ALT2C:  MOV     SAVE,SP            ;RE-SET STACK
   540  001560  062716  000002                    ADD     #2,(SP)            ;SET NEW RETURN ADDRESS
   541  001564  000002                            RTI                        ;RETURN TO LOC (BR.)+1
   542                                    ;
   543                                    ;
   544                                    ;
   545                                    ;
   546                                    ;
   547                                    ;
   548                                    ;
```

```
                                        ;
                                        ;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  002270                JSR     PC,     SETSWR  ;SET UP SWR POINTER
001576  004767  002406                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  004016  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  C16767  002166  176152 ALTST2: MOV     SAVE7,EMTRP
001656  004767  002260                JSR     PC,     PRINT   ;END-OF-PASS MSG
001662  005031                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  002140 ALT3A:  MOV     EMTRP,SAVE7     ;SAVE EMULATOR TRAP
001702  012767  002034  176120        MOV     #ALT3X,EMTRP    ;SET UP ERROR HALT
001710  022706  000774                CMP     #774,SP         ;HAS STACK BEEN PUSHED TWICE
001714  001414                BEQ     ALT3C
001716  022706  000770                CMP     #770,SP         ;HAS STACK BEEN PUSHED 4 TIMES
001722  001411                BEQ     ALT3C
001724  012767  001744  176072 ALT3B:  MOV     #ALT3BX,PFHAND  ;SET UP POWER FAIL POINTER
001732  012767  000005  176066        MOV     #5,PFHAND+2
001740  010667  002060                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  002036                MOV     SP,SAVE
001766  000000                HALT                    ;END OF STORE ROUTINE
                                        ;ROUTINE TO TEST POWER UP SEQUENCE
                                        ;
                                        ;
001770  016706  002030        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  002010                MOV     SP,SAVE         ;STACK IN SAVE REG.
002014  000000                HALT                    ;STACK INCORRECT
002016  022767  004016  176744 ALT3E:  CMP     #LRTI,770       ;DOES STACK CONTAIN CORRECT INFO
002024  001711                BEQ     ALTST2          ;YES EXIT
002026  011667  001772                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  002020                  JSR     PC,     SETSWR  ;SET UP SWR POINTER
002046  004767  002136                  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  002042                  JSR     PC,     PRINT   ;END-OF-PASS MSG
002100  005060                          MSG7
002102  005767  176070                  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  001700                  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  004016  175660  TEST3B: MOV     #LRTI,EMTRP     ;SET UP EMULATOR TRAP
002150  012767  000005  175654          MOV     #5,EMTRP+2      ;SET UP EMULATOR STATUS
002156  005067  001660                  CLR     SAVE7           ;SET COUNT TO ZERO
002162  013746  000010                  MOV     @#10,-(SP)      ;SAVE ILLEGAL INSTRUCTION       ;DD001
002166  013746  000012                  MOV     @#12,-(SP)      ;TRAP VECTOR                    ;DD001
002172  012737  002362  000010          MOV     #ORION1,@#10    ;                               ;DD001
002200  005000                          CLR     R0              ;CLEAR R0                       ;DD001
002202  000007                          MFPT                    ;WHAT KIND OF CPU?              ;DD001
002204  012637  000012          30$:    MOV     (SP)+,@#12      ;RESTORE                        ;DD001
002210  012637  000010                  MOV     (SP)+,@#10      ;TRAP VECTOR                    ;DD001
002214  022700  000005                  CMP     #5,R0           ;IF R0=5,IT IS J-11             ;DD001
002220  001430                          BEQ     TIMLOQ          ;GO TO ROUTINE FOR ORION        ;DD001
002222  104000                  TIMLOP: EMT+0                   ;EMT TRAP (EMT LOOP=57.4 MICROSEC)
002224  022706  000774                  CMP     #774,SP         ;IS STACK CORRECT AFTER EMT
002230  001407                          BEQ     TEST3D          ;STACK CORRECT CONTINUE
002232  012767  002246  175564          MOV     #HALT13E,PFHAND ;SETUP ERROR HALT
002240  012767  000000  175560          MOV     #0,PFHAND+2     ;SETUP STATUS
002246  000000                  HALT13E:HALT                    ;WAIT FOR RE-START
002250  062767  000001  001564  TEST3D: ADD     #1,SAVE7        ;+1 COUNT
002256  022767  000043  001556          CMP     #35.,SAVE7      ;HAS LOOP TAKEN 2 MILLISECONDS
```

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

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

```
                                        ;ROUTINE TO DETERMINE THE AMOUNT OF MEMORY
                                        ;ROUTINE TESTS FOR A MAX OF 28K
                                        ;
002734  012706  001000          TEST5:  MOV     #1000,  SP              ;SET UP STACK
002740  004767  001176                  JSR     PC,     PRINT   ;OUTPUT TITLE
002744  004610                          MSG1
002746  004767  001114                  JSR     PC,     SETSWR  ;SET UP SWR POINTER
002752  004767  001232                  JSR     PC,     UPDATE          ;UPDATE SWR
002756  005067  001040                  CLR     TEMPST          ;CLEAR TEMP. STORAGE
002762  005067  002216                  CLR     PINFLG          ;CLEAR PWR INT FLAG
002766  012767  003034  175010  LPTST5: MOV     #TREMST,4       ;SET UP FOR BUS TRAP
002774  012767  000340  175004          MOV     #340,6          ;LOCK UP PRIORITY LEVELS
003002  012706  001000                  MOV     #1000,SP
003006  005067  001012                  CLR     SAVE            ;SET UP TEST FOR 8K
003012  005777  001006          EXMST:  TST     @SAVE           ;TEST MEMORY FOR AVAILABILITY
003016  062767  004000  001000          ADD     #4000,SAVE      ;SET UP TEST FOR NEXT 1K
003024  022767  160000  000772          CMP     #160000,SAVE    ;TEST FOR BUS TRAP ERROR
003032  001367                          BNE     EXMST           ;TEST NEXT 4K BLOCK
003034  005737  000042          TREMST: TST     @#42
003040  001407                          BEQ     .+20
003042  022737  003340  000042          CMP     #LOGICAL,@#42
003050  001403                          BEQ     .+10
003052  162767  003000  000744          SUB     #3000,SAVE
003060  162767  000500  000736          SUB     #500,SAVE       ;SET UP FOR LAST AVAILABLE BANK
003066  016767  000732  000724          MOV     SAVE,HLIMIT     ;LAST AVAILABLE MEMORY ADDRESS
003074  012767  000006  174702          MOV     #6,4            ;RESTORE TRAP HALT POINTER
003102  016767  000706  174676          MOV     HLT,6           ;RESTORE HALT.
003110  012767  003424  174706          MOV     #TEST5A,PFHAND  ;SET UP POINTER
003116  012706  001000                  MOV     #1000,SP        ;SET UP STACK
003122  012702  005206                  MOV     #LLIMIT,R2      ;LOW MEMORY LIMIT
003126  012722  152525          FILDAT: MOV     #152525,(2)+    ;LOAD DATA INTO MEMORY
003132  026702  000662                  CMP     HLIMIT,R2       ;COMPARE FOR LAST MEMEORY LOCATION
003136  001373                          BNE     FILDAT          ;LOAD NEXT LOCATION
003140  012702  005206          CMDX:   MOV     #LLIMIT,R2      ;SETUP FOR COMPARE
003144  026702  000650          CMDAT:  CMP     HLIMIT,R2       ;TEST FOR LAST ADDRESS
003150  001103                          BNE     ACTMOD
                                        ;
                                        ;TEST THE TTY BUFFER
                                        ;FOR A CONTROL-G
                                        ;
003152  105737  177560                  TSTB    @#TKS           ;CHAR IN BUFFER?
003156  100020                          BPL     50$             ;NO
003160  013705  177562                  MOV     @#TKB,  R5      ;STORE CHAR
003164  042705  177600                  BIC     #177600,        R5      ;STRIP 8TH BIT
003170  122705  000007                  CMPB    #7,     R5      ;CONTROL-G?
003174  001401                          BEQ     40$             ;YES
003176  000410                          BR      50$             ;NO
003200  016767  174772  001772  40$:    MOV     SWREG,  TEMSWR  ;SAVE SWREG
003206  042767  040000  174762          BIC     #40000, SWREG   ;ENABLE TTY PRINTING
003214  004767  000776                  JSR     PC,     UPDAT1  ;UPDATE SWR
003220  105767  000576          50$:    TSTB    TEMPST          ;PWR FAIL OCCURRED?
003224  100016                          BPL     EOP             ;NO
003226  032767  040000  174742          BIT     #40000, SWREG   ;TTY PRINTING DISABLED?
003234  001026                          BNE     CKACT           ;YES
003236  012767  000001  001740          MOV     #1,     PINFLG  ;SET PWR INT FLAG
003244  004767  000672                  JSR     PC,     PRINT   ;OUTPUT PWR FAIL MSG
```

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

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

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                                        ;
                000240                  NOP=240
004012  177777                          FLAG:177777
004014  000000                          HLT:    HALT
004016  000002                          LRTI:   RTI
004020  017500                          HLIMIT: 17500
004022  000000                          TEMPST: 0

                                        ;WORK REGISTERS
004024  000000                          SAVE:   0
004026  000004                          SAVE1:  4
004030  000000                          SAVE2:  0
004032  000000                          SAVE3:  0
004034  000000                          SAVE4:  0
004036  000000                          SAVE5:  0
004040  000000                          SAVE6:  0
004042  000000                          SAVE7:  0
004044  000000                          SAVE8:  0
004046  000000                          SAVE9:  0
004050  000000                          SAVE10: 0

                177560                  TKS=177560
                177562                  TKB=177562
                177564                  TPS=177564
                177566                  TPB=177566
004052  005015  053520  020122          MSG:    .ASCIZ  <15><12>.PWR FAIL.
004060  040506  046111     000
                004066                          .EVEN

004066  013746  000006          SETSWR: MOV     @#6,-(SP)               ;SAVE CURRENT VECTOR
004072  013746  000004                  MOV     @#4,-(SP)
004076  012737  004112  000004          MOV     #1$,@#4                 ;SET UP TIMEOUT VECTOR
004104  005777  174124                  TST     @SWRG                   ;TRY TO REFERENCE HARDWARE SWR
004110  000404                          BR      2$                      ;BR IF NO TIMEOUT OCCURS
004112  012767  000176  174114  1$:     MOV     #SWREG,SWRG             ;POINT TO SOFTWARE SWR
004120  022626                          CMP     (SP)+,(SP)+             ;RESTORE STACK
004122  012637  000004          2$:     MOV     (SP)+,@#4               ;RESTORE TIMEOUT VECTOR
004126  012637  000006                  MOV     (SP)+,@#6
004132  017767  174076  174036          MOV     @SWRG,  SWREG   ;SAVE SWR AT LOC 176
004140  000207                          RTS     PC
004142  032767  040000  174026  PRINT:  BIT     #40000, SWREG   ;SR14 SET?
004150  001014                          BNE     RETURN          ;YES -DISABLE PRINTING
004152  023727  000042  003340          CMP     @#42,   #LOGICAL        ;UNDER ACT?
004160  001410                          BEQ     RETURN          ;YES
004162  011603                          MOV     (SP),   #3      ;ADDRESS OF MSG AFTER JSR
004164  011303                          MOV     (#3),   #3      ;ADDRESS OF FIRST CHAR OF MSG
004166  105737  177564          4$:     TSTB    @#TPS           ;BUFFER READY?
004172  100375                          BPL     4$              ;NO-LOOP
004174  112337  177566                  MOVB    (#3)+,  @#TPB   ;YES-PUT MSG CHAR INTO BUFFER
004200  001372                          BNE     4$              ;CONTINUE IF CHAR WAS NOT 0
004202  062716  000002          RETURN: ADD     #2,     (SP)    ;SET UP RETURN
004206  000207                          RTS     PC              ;RETURN TO TEST
004210  016767  173762  000762  UPDATE: MOV     SWREG,  TEMSWR  ;STORE SWR VALUE
004216  032767  040000  173752  UPDAT1: BIT     #40000, SWREG   ;TTY PRINTING DISABLED?
```

```
  997  004224  001016                        BNE     90$             ;YES-RETURN TO TEST
  998  004226  023727  000042  003340        CMP     @#42,   #LOGICAL        ;UNDER ACT?
  999  004234  001412                        BEQ     90$             ;YES-RETURN TO TEST
 1000  004236  004767  177700                JSR     PC,     PRINT
 1001  004242  005134                        MSG9
 1002  004244  004767  000014                JSR     PC,     OUTPUT  ;PRINT CURRENT SWR VALUE
 1003  004250  004767  177666                JSR     PC,     PRINT
 1004  004254  005143                        MSG10
 1005  004256  004767  000102                JSR     PC,     INPUT   ;UPDATE OR SAVE SWR
 1006  004262  000207              90$:      RTS     PC
 1007                                                                ;
 1008                                                                ;PRINT CURRENT SWR
 1009                                                                ;AT THE TTY
 1010                                                                ;
 1011  004264  012704  005160      OUTPUT:   MOV     #TABLE, %4      ;POINT TO TABLE
 1012  004270  016714  000704                MOV     TEMSWR, (%4)    ;MOVE SAVED SWR TO TABLE
 1013  004274  011467  000702      8$:       MOV     (%4),   ROTATE  ;SAVE CURRENT VALUE
 1014  004300  042714  177770                BIC     #177770,        (%4)    ;CONVERT ONE ASCII CHAR
 1015  004304  062724  000060                ADD     #60,    (%4)+   ;POINT TO NEXT LOC IN TABLE
 1016  004310  022704  005174                CMP     #TABLE+14,      %4      ;IF 6TH DIGIT-
 1017  004314  001411                        BEQ     10$             ;BR
 1018  004316  016714  000660                MOV     ROTATE, (%4)    ;POINT TO NEXT CHAR
 1019  004322  000241                        CLC
 1020  004324  006014                        ROR     (%4)
 1021  004326  000241                        CLC
 1022  004330  006014                        ROR     (%4)
 1023  004332  000241                        CLC
 1024  004334  006014                        ROR     (%4)
 1025  004336  000756                        BR      8$
 1026  004340  105737  177564      10$:      TSTB    @#TPS           ;PRINTER READY?
 1027  004344  100375                        BPL     10$             ;
 1028  004346  014437  177566                MOV     -(%4),  @#TPB   ;OUTPUT CHAR IN TABLE
 1029  004352  022704  005160                CMP     #TABLE, %4      ;OUTPUT ALL CHAR IN TABLE
 1030  004356  001401                        BEQ     12$             ;
 1031  004360  000767                        BR      10$             ;CONTINUE
 1032  004362  000207              12$:      RTS     PC              ;
 1033                                                                ;
 1034                                                                ;UPDATE OR SAVE SWR
 1035                                                                ;
 1036                                                                ;
 1037  004364  005067  000606      INPUT:    CLR     CNTR            ;CLEAR CHARACTER COUNTER
 1038  004370  005067  000600                CLR     USWREG                  ;CLEAR LAST UPDATED SWR
 1039  004374  012704  005160                MOV     #TABLE, %4      ;POINT TO TABLE
 1040  004400  105737  177560      14$:      TSTB    @#TKS           ;CHAR IN BUFFER?
 1041  004404  100375                        BPL     14$             ;NO
 1042  004406  013714  177562                MOV     @#TKB,  (%4)    ;PUT CHAR IN TABLE
 1043  004412  105737  177564      16$:      TSTB    @#TPS           ;PRINTER READY?
 1044  004416  100375                        BPL     16$             ;NO
 1045  004420  011437  177566                MOV     (%4),   @#TPB   ;ECHO INPUT
 1046  004424  042714  177600                BIC     #177600,        (%4)    ;STRIP 8TH BIT
 1047  004430  122714  000015                CMPB    #15,    (%4)    ;CARRIAGE RETURN?
 1048  004434  001417                        BEQ     20$             ;YES
 1049  004436  122714  000060                CMPB    #60,    (%4)    ;ILLEGAL CHAR?
 1050  004442  003055                        BGT     22$             ;YES
 1051  004444  122714  000067                CMPB    #67,    (%4)    ;ILLEGAL CHAR?
 1052  004450  002452                        BLT     22$             ;YES
```

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

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

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```
ACTMOD  003360             808     852#
ALTEST  001406             383     510#
ALTST1  001566             384     556#
ALTST2  001650             567#    596     602
ALT2    001470             515     526#
ALT2A   001512             527     531#
ALT2AX  001530             533     534#
ALT2B   001532             532     535#
ALT2C   001554             536     539#
ALT2X   001510             529     530#
ALT3A   001674             561     577#
ALT3B   001724             583#
ALT3BX  001744             583     586#
ALT3C   001746             580     582     587#
ALT3D   001770             587     594#
ALT3E   002016             598     601#
ALT3X   002034             578     608#
AUTO    003330             839     843#
BR1     003564             869     891#
BR2     003750             908     926#
CKACT   003312             826     833     838#
CMDAT   003144             807#    853     863
CMDX    003140             806#
CNTEMT  003740             919     924#
CNTR    005176            1037*   1053    1056*   1059    1064*   1065    1133#
CONAC   003422             863#
CONAD   003414             861#
EMTRP   000030             391#    563*    564*    567*    577     578*    641*    642*    726*    878*    879*
EMTUP   003706             916#    925
EMTWT   001644             565#
EOP     003262             824     832#
EXMST   003012             787#    790
FILDAT  003126             803#    805
FLAG    004012             843     930*    943#
HALT1   001050             418#
HALT10  001372             500#
HALT11  001402             503#
HALT12  002140             638     640#
HALT13  002246             656     658#
HALT14  002474             714     716#
HALT15  002654             725     748#
HALT16  002656             741     749#
HALT18  003412             857     858#
HALT19  003420             862#
HALT2   001062             422#
HALT20  003464             873     875#
HALT21  004006             876     933#
HALT22  003544             885     886#
HALT23  003664             911     912#
HALT24  004010             913     934#
HALT25  003736             920     922#
HALT3E  001232             461     462#
HALT3Q  002326             668     670#
HALT4E  001264             471     472#
HALT4Q  002730             754     761#
HALT5E  001322             485#
```

CROSS REFERENCE TABLE -- USER SYMBOLS

```
HALT6E  001332            488#
HALT7E  001342            491#
HALT8E  001352            494#
HALT9E  001362            497#
HLIMIT  004020            797*    804     807     946#
HLT     004014            799     944*
INPUT   004364           1005    1037#   1080
LLIMIT  005206            802     806    1137#
LOC     003354            841     844     851#
LOGICA  003340            374     793     846#    985     99F
LPALT   001422            513#    521
LPALT1  001602            559#    571
LPTST1  001014            408#    428
LPTST2  001126            440#    454
LPTST3  002052            619#    626
LPTST4  002406            699#    706
LPTST5  002766            783#    851
LRTI    004016            563     601     641     726     878     945#
MASTER  000200            380#
MASTIM  003522            881#    890
MFPT  = 000007            392#    648     733
MSG     004052            829     967#
MSG1    004610            778    1086#
MSG10   005143           1004    1079    1127#
MSG2    004674            836    1096#
MSG3    004726            426    1101#
MSG4    004754            452    1105#
MSG5    005002            519    1109#
MSG6    005031            569    1113#
MSG7    005060            624    1117#
MSG8    005106            704    1121#
MSG9    005134           1001    1125#
NOP   = 000240            942#
ORION1  002362            646     677#
ORION2  002732            731     762#
OUTPUT  004264           1002    1011#
PFHAND  000024             354#    409*    441*    442*    461*    471*    473*    474*    514*    515*    529*    533*    536*
                           537*    560*    561*    583*    584*    587*    588*    620*    621*    638*    639*    656*    657*
                           662*    668*    669*    674*    700*    701*    714*    715*    717*    718*    725*    741*    742*
                           754*    755*    800*    857*    873*    874*    876*    877*    885*    891*    892*    911*    913*
                           914*    920*    928*    929*
PINFLG  005204            782*    827*    830*    834*    837*    868     907    1136#
PRINT   004142            425     451     518     568     623     703     777     828     835     983#    1000    1003    1078
QPTIME  002660            737     751#    759
REALST  001450            517#    531
RETURN  004202            984     986     993#
ROTATE  005202           1013*   1018    1135#
SAVE    004024            460*    475*    482     528*    535*    539     585*    589*    594     599*    603*    637*    663*
                           675*    683     713*    719*    727     786*    787     788*    789     795*    796*    797     872*
                           884*    893*    903     921*    950#
SAVE1   004026            854*    855*    856     861     951#
SAVE10  004050            896*    906     960#
SAVE2   004030            952#
SAVE3   004032            953#
SAVE4   004034            954#
SAVE5   004036            955#
```

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```
SAVE6   004040            956#
SAVE7   004042            567     577*    643*    659*    660     671*    672     728*    744*    745     757*    758     880*
                          888*    889     915*    917*    924     957#
SAVE8   004044            894*    904     958#
SAVE9   004046            895*    905     959#
SETSWR  004066            406     438     511     557     617     697     779     971#
START1  000204            381#
START2  000210            382#    423
START3  000224            385#
START4  000230            386#
STATUS= 177776            389#    410*    440*    513*    559*
STR2A   000214            383#
STR2B   000220            384#
SWREG   000176            378#    427     453     520     570     625     705     820     821*    825     832     840     976
                          980*    983     995     996     1074*   1076*
SWRG  = 000234            393#    974     976*    980
TABLE   005160           1011    1016    1029    1039    1061    1131#
TEMPST  004022            781*    823     831*    931*    947#
TEMSWR  005200            820*    995*    1012    1076    1134#
TEST1   001000            381     405#
TEST1C  001040            416#
TEST1H  001036            409     412#    416
TEST2   001112            382     437#
TEST2A  001212            442     458#
TEST2B  001234            459     463#
TEST2C  001310            473     482#
TEST2D  001266            470     473#
TEST3   002036            385     616#
TEST3A  002112            620     635#
TEST3B  002142            636     641#
TEST3C  002364            662     674     683#
TEST3D  002250            655     659#
TEST3Q  002330            667     671#
TEST4   002372            696     696#
TEST4A  002446            700     711#
TEST4B  002476            712     717#
TEST4C  002520            717     725#
TEST4D  002632            740     744#
TEST4E  002430            703#    747     760
TEST4Q  002706            753     757#
TEST5   002734            380     776#
TEST5A  003424            800     866#    928
TEST5C  003622            891     903#
TEST5E  003466            871     876#
TIMLOP  002222            653#    661
TIMLOQ  002302            652     665#    673
TKB   = 177562            815     964#    1042
TKS   = 177560            813     963#    1040
TPB   = 177566            966#    991*    1028*   1045*
TPS   = 177564            965#    989     1026    1043
TREMST  003034            783     791#
UPDATE  004210            407     439     512     558     618     698     780     995#
UPDAT1  004216            822     996#
UPTIME  002604            738#    746
UPXTIM  003666            910     913#
USWREG  005174           1038*   1063*   1068*   1070*   1072*   1074    1132#
```

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

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

. ABS.  005210     000

 ERRORS DETECTED:  0

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