KT11-D

KT11 D STATES

MD-11-DBKTD-B

EP-DBKTD-B-DL-B

FICHE 1 OF 1

DEC 1976

digital

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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DBKTD-B

PRODUCT NAME: KT11-D PROCESSORS STATES TEST

DATE RELEASED: FEBRUARY, 1977

MAINTAINER: DIAGNOSTIC GROUP

1.0 ABSTRACT

THIS IS A TEST THAT UTILIZES THE KT11-D MEMORY MANAGEMENT OPTION AND TESTS THAT IN THE TWO PYP-11/40 STATES (KERNEL, USER) INSTRUCTIONS ARE EXECUTED PROPERLY. THIS TEST TESTS TRAPS FROM ONE STATE TO THE OTHER AND USES THE MFPI/MTPI INSTRUCTIONS.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/40 WITH KT11-D (MEM. MGMT.) INSTALLED.

2.2 STORAGE

UTILIZES 4K OF MEMORY

3.0 LOADING PROCEDURE

LOAD PROGRAM INTO MEMORY USING ABSOLUTE LOADER. PROGRAM MAY ALSO BE LOADED VIA XXDP OR ACT11.

4.0 STARTING PROCEDURE

LOAD ADDRESS 200. PRESS START. THE PROGRAM WILL LOOP AND RING BELL AND PRINT AN '*' ON PASS COMPLETION.

5.0 OPERATION PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

NONE

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

SCOPE IS A MOV PC,R1 AND STORE THE PC+2 IN R1. THUS R1 MAY BE USED AS A REFERENCE TO DETERMINE THE LAST TEST SUCCESSFULLY COMPLETED.

5.2.2 HLT

HLT IS A HALT INSTRUCTION AND IS EXECUTED WHENEVER A HARDWARE MALFUNCTION IS DETECTED.

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 PASS COUNT (ICNT)

THE NUMBER OF PROGRAM PASSES COMPLETED IS CONTAINED IN ADDRESS ICNT (LOC. 1000). THIS ADDRESS MAY BE EXAMINED TO DETERMINE IN WHICH PASS THE ERROR OCCURED.

6.0 ERRORS

6.1 TEST ERROR WILL CAUSE A HALT

FALSE TRAP/INTERRUPT ERRORS - THE PROGRAM WILL HALT AT THE TRAP VECTOR ADDRESS +2. THE CONTENTS OF R6 CONTAINS THE ADDRESS WHERE THE PC OF THE INSTRUCTION THAT CAUSED THE TRAP IS STORED.

6.2 ERROR RECOVERY

TEST ERRORS - PRESS CONTINUE OR LOOP TEST (SEE 6.3)
TRAP ERRORS - DETERMINE WHERE ERROR OCCURED (SEE 6.1)

6.3 ERROR LOOPING

TO LOOP ON AN ERROR REPLACE THE HLT INSTRUCTION WITH A BRANCH BACK TO THE PREVIOUS SCOPE INSTRUCTION. NOTE THAT IF THE ERROR IS INTERMITTENT THE TEST WILL DROP THROUGH THE HLT AND PROCEED TO THE NEXT TEST. THEREFORE, TO LOOP THE TEST CONTINUOUSLY, REPLACE THE BEQ .+4 INSTRUCTION PRECEEDING THE HLT WITH THE BRANCH BACK TO THE PREVIOUS SCOPE.

7.0 RESTRICTIONS

THIS PROGRAM MUST BE LOADED IN LOWER 4K.

7.1 STARTING RESTRICTION

ALL PROGRAMS MUST BE INITIALLY STARTED AT 200 AND MAY BE STARTED AT A SCOPE INSTRUCTION THEREAFTER.

7.2 OPERATIONAL RESTRICTIONS

NONE

8.1 EXECUTION TIME

ONE PASS TAKES APPROXIMATELY 10 SECONDS.

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150
151
152
153
154
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167
168
169
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                                .NLIST  SEQ

                                .TITLE  TEST DBKTDA FDP11/40 PROCESSER STATES TEST
                                .ABS

                        ;TEST DBKTDA TESTS FEATURES OF THE TWO PROCESSER STATES AND INCLUDES
                        ;TRAPS FROM ALL STATES TO ALL OTHER STATES, AND MFP/MTP INSTRUCTIONS IN ALL
                        ;STATES AND PREVIOUS STATES.
                        ;NOTE: ALL TESTS ARE ENTERED AND EXITED IN KERNEL MODE.

                        ;STARTING PROCEEDURE
                        ;       LOAD ADDRESS=200
                        ;       PRESS START
                        ;       KERNEL STACK POINTER IS AT 500
                        ;       USER STACK POINTER IS AT 700
                        ;       BELL WILL RING WHEN TEST IS COMPLETE

                        ;REGISTER ASSIGNMENTS
000000                  R0=%0
000001                  R1=%1
000002                  R2=%2
000003                  R3=%3
000004                  R4=%4
000005                  R5=%5
000007                  PC=%7

                        ;STACK POINTERS
000006                          KSP=%6                  ;KERNEL STACK POINTER
000006                          USP=%6                  ;USER STACK POINTER
000000                          HLT=HALT
010701                  SCOPE=010701                    ;MOVE PC TO R1
000003                          TRT=3                   ;TRACE TRAP
000140                          PRTY3=140
000200                          PRTY4=200
000340                          PRTY7=340

                        ;VECTOR ADDRESSES
000004                          ERRVEC=4                ;ADDRESS OF ERROR VECTOR
000010                          RESVEC=10               ;ADDRESS OF RESERVED INST TRAP VECTOR
000030                          EMTVEC=30               ;ADDRESS OF EMT VECTOR
000034                          TRAPVEC=34              ;ADDRESS OF TRAP VECTOR
000020                          IOTVEC=20               ;ADDRESS OF IOT VECTOR
000014                          TBITVEC=14              ;ADDRESS OF 'T' BIT TRAP VECTOR
000014                          TRTVEC=14               ;ADDRESS OF 'TRACE' TRAP
000064                          TPVEC=64                ;ADDRESS OF TTY PRINTER INTERRUPT VECTOR
                        ;HARDWARE REGISTER ASSIGNMENTS
177776                          PSW=177776              ;ADDRESS OF STATUS REGISTER
177774                          SLR=177774              ;ADDRESS OF STACK LIMIT REGISTER
177560                          TKS=177560              ;ADDRESS OF KEYBOARD CSR
177562                          TKB=177562              ;ADDRESS OF KEYBOARD BUFFER
177564                          TPS=177564              ;ADDRESS OF TELEPRINTER CSR
177566                          TPB=177566              ;ADDRESS OF TELEPRINTER BUFFER
177570                          SWR=177570              ;ADDRESS OF CONSOL SWITCH REGISTER
                        ;INITIAL STACK POINTER SETTIGS
000500                          KPTR=500                ;KERNEL INITIAL STACK POINTER VALUE
000700                          JPTR=700                ;USER INITIAL STACK POINTER VALUE
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                    001000                  YELPTR=1000             ;STACK POINTER VALUE FOR 'YELLOW' OVFLW
                    000736                  REDPTR=736              ;STACK POINTER VALUE FOR 'RED' OVFLW

                                        ;MISC. BIT ASSIGNMENTS
                    100000                  BIT15=100000
                    040000                  BIT14=40000
                    020000                  BIT13=20000
                    000100                  BIT6=100


                                        ;STATUS REGISTER BIT ASSIGNMENTS
                    140000                  UM=140000               ;USER MODE
                    100000                  IM=100000               ;ILLEGAL MODE
                    040000                  IM1=40000               ;ILLEGAL MODE
                    000000                  KM=0                    ;KERNEL MODE
                    030000                  PUM=030000              ;PREVIOUS USER MODE
                    000000                  PKM=0                   ;PREVIOUS KERNEL MODE
                    000000                  REG=0                   ;REGISTER BIT:  HAS NO EFFECT!!!!
                    000020                  TBIT=20                 ;'T' BIT IN @#PSW
                    000001                  C=1                     ;'C' BIT IN PS
                    000002                  V=2                     ;'V' BIT IN PS
                    000004                  Z=4                     ;'Z' BIT IN PS
                    000010                  N=10                    ;'N' BIT IN PS

                    000000                  .=0
000000  000002              .+2
000002  000000              HALT
000004  000006              .+2
000006  000000              HALT
000010  000012              .+2
000012  000000              HALT
000014  000016              .+2
000016  000000              HALT
000020  000022              .+2
000022  000000              HALT
000024  000026              .+2
000026  000000              HALT
000030  000032              .+2
000032  000000              HALT
000034  000036              .+2
000036  000000              HALT
000040  000042              .+2
000042  000000              HALT
000044  000046              .+2
000046  000000              HALT
000050  000052              .+2
000052  000000              HALT
000054  000056              .+2
000056  000000              HALT
000060  000062              .+2
000062  000000              HALT
000064  000066              .+2
000066  000000              HALT
000070  000072              .+2
000072  000000              HALT
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000074  000076          .+2
000076  000000          HALT
000100  000102          .+2
000102  000000          HALT
000104  000106          .+2
000106  000000          HALT
000110  000112          .+2
000112  000000          HALT
000114  000116          .+2
000116  000000          HALT
000120  000122          .+2
000122  000000          HALT
000124  000126          .+2
000126  000000          HALT
000130  000132          .+2
000132  000000          HALT
000134  000136          .+2
000136  000000          HALT
000140  000142          .+2
000142  000000          HALT
000144  000146          .+2
000146  000000          HALT
000150  000152          .+2
000152  000000          HALT
000154  000156          .+2
000156  000000          HALT
000160  000162          .+2
000162  000000          HALT
000164  000166          .+2
000166  000000          HALT
000170  000172          .+2
000172  000000          HALT
000174  000176          .+2
000176  000000          HALT
000200  000202          .+2
000202  000000          HALT
000204  000206          .+2
000206  000000          HALT
000210  000212          .+2
000212  000000          HALT
000214  000216          .+2
000216  000000          HALT
000220  000222          .+2
000222  000000          HALT
000224  000226          .+2
000226  000000          HALT
000230  000232          .+2
000232  000000          HALT
000234  000236          .+2
000236  000000          HALT
000240  000242          .+2
000242  000000          HALT
000244  000246          .+2
000246  000000          HALT
000250  000252          .+2
000252  000000          HALT
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000254  000256                  .+2
000256  000000                  HALT
000260  000262                  .+2
000262  000000                  HALT
000264  000266                  .+2
000266  000000                  HALT
000270  000272                  .+2
000272  000000                  HALT
000274  000276                  .+2
000276  000000                  HALT
000300  000302                  .+2
000302  000000                  HALT
000304  000306                  .+2
000306  000000                  HALT
000310  000312                  .+2
000312  000000                  HALT
000314  000316                  .+2
000316  000000                  HALT
000320  000322                  .+2
000322  000000                  HALT
000324  000326                  .+2
000326  000000                  HALT
000330  000332                  .+2
000332  000000                  HALT
000334  000336                  .+2
000336  000000                  HALT
000340  000342                  .+2
000342  000000                  HALT
000344  000346                  .+2
000346  000000                  HALT
000350  000352                  .+2
000352  000000                  HALT
000354  000356                  .+2
000356  000000                  HALT
000360  000362                  .+2
000362  000000                  HALT
000364  000366                  .+2
000366  000000                  HALT
000370  000372                  .+2
000372  000000                  HALT
000374  000376                  .+2
000376  000000                  HALT

        000046                  .=46
000046  006444                  LOGIC
        000052                  .=52
000052  040000                  40000
        000200                  .=200
000200  000167  000606          JMP     START           ;GO START

        001000                  .=1000
                        ;TAGS

001000  000000          ICNT:   0                       ;CONTAINS PASS COUNT
001002  000000          TEMP:   0
        001012                  .=.+6
```

```
001012  012706  000500          START:  MOV     #KPTR,KSP
001016  005067  177756                  CLR     ICNT
                                ;TEST THAT PROCESSER POWERED UP OK FOR THE TEST
001022  032737  000000  177776  PWRUP:  BIT     #KM+PKM,@#PSW   ;IS STATUS CORRECT
001030  001377                  BNE     .               ;LOOP HERE IF NOT

001032  012706  000500          BEGIN:  MOV     #KPTR,KSP       ;INITIALIZE THE STACK POINTER

                                ;CHECK THAT THE NOP INSTRUCTION IS A 'NOP' IN USER MODE.
001036  010701                  T1:     SCOPE
001040  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE,PRIORITY LEVEL 0
001046  000240                  NOP
001050  013700  177776          MOV     @#PSW,R0        ;GET @#PSW
001054  005037  177776          CLR     @#PSW           ;KERNEL MODE!!!
001060  022700  140000          CMP     #UM,R0          ;TEST THAT NOP DID NOT ALTER @#PSW
001064  001401                  BEQ     .+4
001066  000000                  HLT                     ;ERROR! NOP CHANGED STATUS WORD


                                ;TEST TRAP FROM USER MODE TO KERNEL MODE
001070  010701                  T5:     SCOPE
001072  012706  000500          MOV     #KPTR,KSP
001076  012737  001134  000020  MOV     #T5A,@#IOTVEC
001104  005067  176712          CLR     IOTVEC+2
001110  012737  140340  177776  MOV     #UM+PRTY7,@#PSW ;USER MODE!!!
001116  012706  000700          MOV     #UPTR,USP
001122  000277                  SCC
001124  000004                  IOT
001126  005037  177776  T5AA:   CLR     @#PSW
001132  000000                  HLT
001134  013700  177776  T5A:    MOV     @#PSW,R0
001140  005037  177776          CLR     @#PSW
001144  022700  030000          CMP     #KM+PUM,R0
001150  001401                  BEQ     .+4
001152  000000                  HLT
001154  022767  001126  177312  CMP     #T5AA,KPTR-4
001162  001401                  BEQ     .+4
001164  000000                  HLT
001166  022767  140357  177302  CMP     #UM+PRTY7+17,KPTR-2
001174  001401                  BEQ     .+4
001176  000000                  HLT
001200  022706  000474          CMP     #KPTR-4,KSP
001204  001401                  BEQ     .+4
001206  000000                  HLT
001210  012737  140000  177776  MOV     #UM,@#PSW
001216  010600                  MOV     USP,R0
001220  005037  177776          CLR     @#PSW
001224  022700  000700          CMP     #UPTR,R0
001230  001401                  BEQ     .+4
001232  000000                  HLT
001234  012737  000022  000020  MOV     #IOTVEC+2,@#IOTVEC

                                ;TEST TRAP FROM USER TO USER MODE (VIA TRACE TRAP)
001242  010701                  T7:     SCOPE
001244  012767  001302  176542          MOV     #T7A,TRTVEC
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001252  012767  140000  176536          MOV     #UM,TRTVEC+2    ;USER MODE ON TRAP
001260  012737  140000  177776          MOV     #UM,@#PSW
001266  012706  000700                  MOV     #UPTR,USP
001272  000003                          TRT
001274  005037  177776          T7AA:   CLR     @#PSW
001300  000000                          HLT
001302  013700  177776          T7A:    MOV     @#PSW,R0
001306  010602                          MOV     USP,R2
001310  042737  140000  177776          BIC     #UM,@#PSW
001316  022767  001274  177350          CMP     #T7AA,UPTR-4
001324  001401                          BEQ     .+4
001326  000000                          HLT
001330  022700  170000                  CMP     #UM+PUM,R0
001334  001401                          BEQ     .+4
001336  000000                          HLT
001340  012767  000016  176446          MOV     #TRTVEC+2,TRTVEC
001346  005067  176444                  CLR     TRTVEC+2

                                ;TEST THAT THE 'HALT' INSTRUCTION TRAPS TO LOCATION 10 IN
                                ;USER MODE.
001352  010701                  T12:    SCOPE
001354  012737  001410  000010          MOV     #T12A,@#RESVEC
001362  005037  000012                  CLR     @#RESVEC+2
001366  012706  000500                  MOV     #KPTR,KSP
001372  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE!!!
001400  000000                          HALT                    ;HALT TRAPS IN USER MODE
001402  005037  177776          T12AA:  CLR     @#PSW
001406  000000                          HALT                    ;ERROR!  HALT DID NOT TRAP
001410  013700  177776          T12A:   MOV     @#PSW,R0
001414  005037  177776                  CLR     @#PSW
001420  022700  030000                  CMP     #KM+PUM,R0
001424  001401                          BEQ     .+4
001426  000000                          HLT
001430  022767  001402  177036          CMP     #T12AA,KPTR-4
001436  001401                          BEQ     .+4
001440  000000                          HLT

                                ;CHECK THAT SPL TRAPS TO 10 IN USER MODE.
001442  010701                  T13:    SCOPE
001444  012737  001474  000010          MOV     #T13A,@#RESVEC
001452  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
001456  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE!!!
001464  000237                          SPL     7               ;SPL TRAPS IN USER MODE
001466  005037  177776          T13AA:  CLR     @#PSW           ;KERNEL MODE!!!
001472  000000                          HLT                     ;ERROR! SPL FAILED TO TRAP IN USER MODE
001474  013700  177776          T13A:   MOV     @#PSW,R0
001500  005037  177776                  CLR     @#PSW
001504  022700  030000                  CMP     #KM+PUM,R0
001510  001401                          BEQ     .+4
001512  000000                          HLT
001514  022767  001466  176752          CMP     #T13AA,KPTR-4
001522  001401                          BEQ     .+4
001524  000000                          HLT
001526  012737  000012  000010          MOV     #RESVEC+2,@#RESVEC

                                ;TEST THAT "RESET" RESETS IN KERNEL MODE
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001534  010701                      T18:    SCOPE
001536  005037  177776                      CLR     @#PSW
001542  012737  000340  177776              MOV     #PRTY7,@#PSW    ;PRIORITY TO 7
001550  012767  000100  176006              MOV     #100,177564     ;SET "IE" IN TPS
001556  000005                              RESET                   ;CLEAR "IE"
001560  005037  177776                      CLR     @#PSW
001564  032767  000100  175772              BIT     #100,177564
001572  001401                              BEQ     .+4
001574  000000                              HLT                     ;RESET DID NOT
                                                                    ;CLEAR "IE"

                                    ;TEST THAT "RESET" NOP'S IN USER MODE
001576  010701                      T19:    SCOPE
001600  012737  140340  177776              MOV     #UM+PRTY7,@#PSW ;USER MODE!!!
001606  012767  000100  175750              MOV     #100,177564     ;SET "IE"
001614  000005                              RESET                   ;SHOULD NOP
001616  032767  000100  175740              BIT     #100,177564
001624  001001                              BNE     .+4
001626  000000                              HLT                     ;"IE" CLEARED
001630  005067  175730                      CLR     177564
001634  005037  177776                      CLR     @#PSW

                                    ;TEST INTERRUPT SEQUENCE USER TO KERNEL MODE
001640  010701                      T15:    SCOPE
001642  012706  000500                      MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
001646  012737  170340  177776              MOV     #UM+PUM+PRTY7,@#PSW     ;USER MODE!!!
001654  012767  001720  176202              MOV     #T15A,64                ;INTERRUPT VEC.
001662  012767  000200  176176              MOV     #KM+PRTY4,66
001670  012706  000700                      MOV     #UPTR,USP       ;SET USER STACK POINTER
001674  042737  000200  177776              BIC     #PRTY4,@#PSW    ;SET PRIORITY LEVEL=3
001702  012767  000100  175654              MOV     #100,177564     ;REQUEST AN INTERRUPT AT LEVEL 4
001710  000240                              NOP
001712  005037  177776          T15AA:      CLR     @#PSW           ;KERNEL MODE!!!
001716  000000                              HLT                     ;ERROR! NO INTERRUPT REQUEST
001720  013700  177776          T15A:       MOV     @#PSW,R0        ;GET 'NEW" @#PSW
001724  005067  175634                      CLR     177564          ;DISABLE REQUEST
001730  005037  177776                      CLR     @#PSW
001734  022700  030200                      CMP     #KM+PUM+PRTY4,R0  ;TEST THAT 'NEW' @#PSW IS CORRECT
001740  001401                              BEQ     .+4             ;(PIRVEC+2)
001742  000000                              HLT                     ;ERROR! 'NEW' @#PSW NOT = TO (PIRVEC+2)
001744  022767  001712  176522              CMP     #T15AA,KPTR-4   ;IS RETURN ADDRESS ON KERNEL STACK
001752  001401                              BEQ     .+4
001754  000000                              HLT                     ;ERROR! RETURN ADDRESS NOT ON KERNEL STACK
001756  022767  170140  176512              CMP     #UM+PUM+PRTY3,KPTR-2  ;TEST THAT 'OLD' @#PSW WAS SAVED ON
001764  001401                              BEQ     .+4             ;KERNEL STACK
001766  000000                              HLT                     ;ERROR!
001770  012767  000066  176066              MOV     #66,64
001776  005067  176064                      CLR     66

                                    ;TEST THAT THERE IS NO STACK OVERFLOW IN USER MODE.
002002  010701                      T17:    SCOPE
002004  012737  000400  177774              MOV     #400,@#SLR      ;SET STACK LIMIT =1000
002012  012737  140000  177776              MOV     #UM,@#PSW       ;USER MODE!!!
002020  012737  002250  000004              MOV     #T17ERR,@#ERRVEC
002026  012706  000700                      MOV     #UPTR,USP       ;SET USER STACK POINTER
002032  005067  176744                      CLR     TEMP            ;CLEAR INDICATOR LOCATION
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002036  004767  000006          T17A:   JSR     7,T17B          ;PUSH ONTO USER STACK
002042  052767  000400  176732          BIS     #400,TEMP       ;SET ERROR INDICATOR BIT
002050  052767  000001  176724  T17B:   BIS     #1,TEMP         ;SET INDICATOR   T
002056  004567  000006                  JSR     5,T17C          ;PUSH ONTO USER STACK
002062  052767  001000  176712          BIS     #1000,TEMP      ;SET ERRROR INDICATOR BIT
002070  052767  000002  176704  T17C:   BIS     #2,TEMP         ;SET INDICATOR BIT
002076  050546                          BIS     R5,-(USP)       ;PUSH ONTO USER STACK
002100  052767  000004  176674          BIS     #4,TEMP         ;SET INDICATOR BIT
002106  052737  000000  177776          BIS     #REG,@#PSW      ;SELECT R0-R5
002114  004767  000006                  JSR     7,T17D          ;PUSH ONTO USER STACK
002120  052767  002000  176654          BIS     #2000,TEMP      ;SET ERROR INDICATOR BIT
002126  052767  000010  176646  T17D:   BIS     #10,TEMP
002134  012702  002150                  MOV     #T17E,R2        ;SET UP RETURN FOR RTS
002140  000202                          RTS     R2              ;GO TO T16E
002142  052767  004000  176632          BIS     #4000,TEMP      ;SET INDICATOR TO SHOW ERROR
002150  052767  000020  176624  T17E:   BIS     #20,TEMP
002156  004567  000006                  JSR     R5,T17F
002162  052767  010000  176612          BIS     #10000,TEMP     ;SET ERROR INDICATOR BIT
002170  052767  000040  176604  T17F:   BIS     #40,TEMP
002176  012737  002222  000034          MOV     #T17G,@#TRAPVEC ;SET UP TRAP VECTOR FOR TRAP
002204  012737  140000  000036          MOV     #UM,@#TRAPVEC+2
002212  104400                          TRAP
002214  052767  020000  176560          BIS     #20000,TEMP
002222  052767  000100  176552  T17G:   BIS     #100,TEMP
002230  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!
002234  022767  000177  176540          CMP     #177,TEMP
002242  001401                          BEQ     .+4
002244  000000                          HLT
002246  000403                          BR      T17X
002250  005037  177776  T17ERR: CLR     @#PSW
002254  000000                          HLT                     ;ERROR! OVERFLOW OCCURED
002256  005037  177774  T17X:   CLR     @#SLR
002262  012737  000036  000034          MOV     #TRAPVEC+2,@#TRAPVEC
002270  005067  175542                  CLR     TRAPVEC+2

                        ;TEST THAT MTPD/I POPS WORD OFF THE THE APPROPRIATE STACK (AS
                        ;DETERMINED BY BITS 15&14 IN @#PSW.)
                        ;MTPD, KERNEL MODE
002274  010701          T21:    SCOPE
002276  005037  177776          CLR     @#PSW
002302  012706  000500          MOV     #KPTR,KSP               ;SET KERNEL STACK POINTER
002306  012700  177777          MOV     #-1,R0                  ;PRE-SET R0
002312  005016                  CLR     (KSP)                   ;PUT 0 ON THE STACK
002314  012737  030011  177776  MOV     #PUM+N+C,@#PSW          ;PRE SET STATUS
002322  006600                  MTPI    R0                      ;R0<--(KSP)+

002324  013702  177776          MOV     @#PSW,R2                ;GET STATUS
002330  022702  030005          CMP     #PUM+Z+C,R2
002334  001401                  BEQ     .+4
002336  000000                  HLT                             ;ERROR! INCORRECT STATUS
002340  022706  000502          CMP     #KPTR+2,KSP             ;DID KSP INCREMENT BY 2
002344  001401                  BEQ     .+4
002346  000000                  HLT                             ;ERROR!  KSP DID NOT POP
002350  005700                  TST     R0                      ;DID WORD ON STACK (0) GET TO R0?
002352  001401                  BEQ     .+4
002354  000000                  HLT                             ;ERROR! MTPD DID NOT POP 0 OFF
```

```
                                                                ;KSP INTO R0

                                        ;MTPI,KERNEL MODE
002356  010701                          †22:    SCOPE
002360  005037  177776                          CLR     @#PSW
002364  012706  000500                          MOV     #KPTR,KSP
002370  005002                                  CLR     R2                      ;PRESET R2
002372  012716  177777                          MOV     #-1,(KSP)
002376  012737  030006  177776                  MOV     #PUM+Z+V,@#PSW          ;PRESET STATUS
002404  006602                                  MTPI    R2                      ;R2←(KSP)+

002406  013700  177776                          MOV     @#PSW,R0                ;GET STATUS
002412  022700  030010                          CMP     #PUM+N,R0
002416  001401                                  BEQ     .+4
002420  000000                                  HLT                             ;ERROR! INCORRECT STATUS
002422  022706  000502                          CMP     #KPTR+2,KSP
002426  001401                                  BEQ     .+4
002430  000000                                  HLT                             ;ERROR!
002432  005202                                  INC     R2
002434  001401                                  BEQ     .+4
002436  000000                                  HLT                             ;ERROR!

                                        ;MTPD, USER MODE
002440  010701                          †25:    SCOPE
002442  012737  140000  177776                  MOV     #UM,@#PSW
002450  012706  000700                          MOV     #UPTR,USP
002454  052716  177777                          BIS     #-1,(USP)
002460  000261                                  SEC
002462  042705  177777                          BIC     #-1,R5
002466  006605                                  MTPI    R5                      ;R5←(USP)+

002470  013700  177776                          MOV     @#PSW,R0
002474  010602                                  MOV     USP,R2
002476  005037  177776                          CLR     @#PSW
002502  022700  140011                          CMP     #UM+N+C,R0
002506  001401                                  BEQ     .+4
002510  000000                                  HLT
002512  022702  000702                          CMP     #UPTR+2,R2
002516  001401                                  BEQ     .+4
002520  000000                                  HLT
002522  005205                                  INC     R5
002524  001401                                  BEQ     .+4
002526  000000                                  HLT


                                        ;MTPI, USER MODE
002530  010701                          †26:    SCOPE
002532  012737  140000  177776                  MOV     #UM,@#PSW
002540  012706  000700                          MOV     #UPTR,USP
002544  042716  177777                          BIC     #-1,(USP)
002550  052700  177777                          BIS     #-1,R0
002554  000257                                  CCC
002556  006600                                  MTPI    R0                      ;R0←(USP)+

002560  013702  177776                          MOV     @#PSW,R2
002564  010603                                  MOV     USP,R3
```

```
002566  005037  177776                  CLR     @#PSW
002572  022702  140004                  CMP     #UM+2,R2
002576  001401                          BEQ     .+4
002600  000000                          HLT
002602  022703  000702                  CMP     #UPTR+2,R3
002606  001401                          BEQ     .+4
002610  000000                          HLT
002612  005700                          TST     R0
002614  001401                          BEQ     .+4
002616  000000                          HLT

                                ;TEST THAT MTP D/I POPS WORD OFF STACK (AS DETERMINED BY BITS 15 & 14
                                ;INTO STACK POINTER (AS DETERMINED BY BITS 13 & 12).
                                ;USP←(KSP)+,MTPD
002620  010701                  T30:    SCOPE
002622  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE!!!
002630  005006                          CLR     USP             ;PRESET USER STACK POINTER
002632  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!, PREV USER MODE!!
002640  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
002644  012716  000700                  MOV     #UPTR,(KSP)
002650  000277                          SCC                     ;PRESET CC'S
002652  006606                          MTPI    USP             ;USP←(KSP)+

002654  013702  177776                  MOV     @#PSW,R2        ;SAVE CC'S
002660  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE!!!
002666  010600                          MOV     USP,R0          ;GET USER STACK POINTER
002670  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!
002674  022700  000700                  CMP     #UPTR,R0        ;CHECK THAT MTPD SET USER STACK
002700  001401                          BEQ     .+4             ;POINTER PROPERLY
002702  000000                          HLT                     ;ERROR!
002704  022706  000502                  CMP     #KPTR+2,KSP     ;CHECK KERNEL STACK POINTER
002710  001401                          BEQ     .+4
002712  000000                          HLT

                                ;KSP←(KSP)+,MTPD
002714  010701                  T31:    SCOPE
002716  012706  000500                  MOV     #KPTR,KSP
002722  012716  000736                  MOV     #REDPTR,(KSP)
002726  006606                          MTPI    KSP             ;KSP←(KSP)+
002730  022706  000736                  CMP     #REDPTR,KSP
002734  001401                          BEQ     .+4
002736  000000                          HLT

                                ;;USP←(USP)+,MTPD
002740  010701                  T31C:   SCOPE
002742  012737  170000  177776          MOV     #UM+PUM,@#PSW   ;USER MODE!!!, PREV USER MODE!!
002750  012706  000700                  MOV     #UPTR,USP       ;SET USER STACK PTR
002754  005016                          CLR     (USP)           ;PUT #0 ON USER STACK
002756  000257                          CCC
002760  006606                          MTPI    USP             ;USP←(USP)+

002762  013700  177776                  MOV     @#PSW,R0                ;SAVE CC'S
002766  010602                          MOV     USP,R2          ;SAVE USER STACK POINTER
002770  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!
```

```
003774  022700  170004                  CMP     #UM+PUM+Z,R0    ;CHECK STATUS
004000  001401                          BEQ     .+4
004002  000000                          HLT                     ;ERROR! INCORRECT STATUS AFTER MTPD
004004  005702                          TST     R2              ;CHECK NEW STACK POINTER VALUE
004006  001401                          BEQ     .+4
004010  000000                          HLT                     ;ERROR! MTPD FAILED TO SET USER STACK POINTER

                                ;USP←(KSP)+,MTPI
                        †32A:   SCOPE
004012  010701
004014  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE
004022  012706  177777                  MOV     #-1,USP         ;PRESET USER STACK POINTER
004026  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;CURRENT KERNEL,PREVIOUS USER
004034  005046                          CLR     -(KSP)
004036  006606                          MTPI    USP             ;USP←(KSP+

004040  012737  140000  177776          MOV     #UM,@#PSW
004046  010600                          MOV     USP,R0                  ;GET USER STACK POINTER
004050  005037  177776                  CLR     @#PSW
004054  005700                          TST     R0
004056  001401                          BEQ     .+4
004060  000000                          HLT

                                ;USP←(USP)+
                        †35:    SCOPE
004062  010701
004064  012737  170000  177776          MOV     #UM+PUM,@#PSW
004072  012706  000700                  MOV     #UPTR,USP
004076  012716  000700                  MOV     #UPTR,(USP)
004102  006606                          MTPI    USP                     ;USP←(USP)+

004104  010600                          MOV     USP,R0
004106  005037  177776                  CLR     @#PSW
004112  022700  000700                  CMP     #UPTR,R0
004116  001401                          BEQ     .+4
004120  000000                          HLT

                                ;TEST THAT MTPD/I TRAPS ON AN ODD ADDRESS DESTINATION
                                ;KERNEL MODE
                        †36:    SCOPE
004122  010701
004124  005037  177776                  CLR     @#PSW
004130  012706  000500                  MOV     #KPTR,KSP
004134  012716  177777                  MOV     #-1,(KSP)
004140  012737  004160  000004          MOV     #T36A,@#ERRVEC
004146  005067  174634                  CLR     ERRVEC+2
004152  006667  174621                  MTPI    -1                      ;TRAPS ON ODD-ADDRESS
004156  000000                  T36AA:  HLT                     ;ERROR! DID NOT TRAP
004160  022706  000476          T36A:   CMP     #KPTR-2,KSP     ;IS KSP CORRECT (1 POP AND 2
004164  001401                          BEQ     .+4             ;PUSHES)
004166  000000                          HLT                     ;ERROR! INCORRECT VALUE IN KSP
004170  022767  004156  175300          CMP     #T36AA,KPTR-2
004176  001401                          BEQ     .+4
004200  000000                          HLT

                                ;USER MODE
                        †40:    SCOPE
004202  010701
004204  012737  170000  177776          MOV     #UM+PUM,@#PSW   ;USER MODE!!!, PREV USER MODE!!
```

```
003212  012702  000001                  MOV     #1,R2
003216  012706  000700                  MOV     #UPTR,USP       ;SET USER STACK POINTER
003222  012716  125252                  MOV     #125252,(USP)   ;PRESET USER STACK
003226  012737  003252  000004          MOV     #T40A,@#ERRVEC  ;LOAD ERROR VECTOR
003234  012737  140000  000006          MOV     #UM,@#ERRVEC+2
003242  006642                          MTPI    -(R2)           ;-(R2)+(USP)+;SHOULD TRAP ON ODD ADRS
003244  005037  177776          T40AA:  CLR     @#PSW           ;KERNEL MODE!!!
003250  000000                          HLT                     ;ERROR DID NOT TRAP
003252  010600                  T40A:   MOV     USP,R0          ;GET USERS STACK POINTER
003254  042737  140000  177776          BIC     #UM,@#PSW       ;KERNEL MODE!!!
003262  022700  000676                  CMP     #UPTR-2,R0      ;CHECK THAT USER STACK POINTER
003266  001401                          BEQ     .+4             ;PUSHED PROPERLY (1 POP,2 PUSHES.
003270  000000                          HLT                     ;ERROR! INCORRECT USER STACK POINTER
003272  022737  170010  000700          CMP     #UM+PUM+N,@#UPTR        ;CHECK THAT CORRECT STATUS WAS
003300  001401                          BEQ     .+4             ;SAVED ON USER STACK ('N' IS DATA POPPED.
003302  000000                          HLT                     ;ERROR! INCORRECT STATUS SAVED ON USER STACK
003304  022767  003244  175364          CMP     #T40AA,UPTR-2   ;CHECK THAT RETURN ADDRESS WAS
003312  001401                          BEQ     .+4             ;SAVED ON USER STACK
003314  000000                          HLT                     ;ERROR! RETURN PC NOT ON USER STACK
003316  022702  177777                  CMP     #-1,R2                  ;DID R2 DECREMENT BY 2
003322  001401                          BEQ     .+4
003324  000000                          HLT
                                ;TEST THAT MTP D/I CAN LOAD MEMORY ADDRESSES.
                                ;KERNEL MODE
003326  010701                  T41:    SCOPE
003330  005037  177776                  CLR     @#PSW
003334  012700  177777                  MOV     #-1,R0
003340  012737  003374  000004          MOV     #T41A,@#ERRVEC
003346  005067  174434                  CLR     ERRVEC+2
003352  052737  000000  177776          BIS     #REG,@#PSW      ;R0-R5
003360  005000                          CLR     R0
003362  012746  000002                  MOV     #2,-(KSP)
003366  000261                          SEC
003370  006620                          MTPI    (R0)+                   ;(R0)+-(KSP)+
003372  000401                          BR      .+4
003374  000000                  T41A:   HLT                     ;ERROR! TRAPPED
003376  103401                          BCS     .+4             ;MTP D/I SHOULD NOT AFFECT CARRY
003400  000000                          HLT                     ;BIT ERROR! CARRY BIT BUT CLEARED.
003402  022767  000002  174370          CMP     #2,0
003410  001401                          BEQ     .+4
003412  000000                          HLT


003414  010701                  T41B:   SCOPE
003416  012737  003444  000004          MOV     #T41BB,@#ERRVEC ;LOAD ERROR VECTOR
003424  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
003430  012716  177777                  MOV     #-1,(KSP)       ;LOAD KERNEL STACK
003434  000257                          CCC                     ;PRESET CC'S
003436  006637  001002                  MTPI    @#TEMP          ;@#TEMP+(KSP)+

003442  000401                          BR      .+4
003444  000000                  T41BB:  HLT                     ;ERROR! TRAPPED
003446  013700  177776                  MOV     @#PSW,R0                ;SAVE CC'S
003452  022700  000010                  CMP     #REG+N,R0       ;CHECK RESULT STATUS
003456  001401                          BEQ     .+4
003460  000000                          HLT                     ;ERROR! INCORRECT STATUS AFTER MTPD
```

```
003462  005237  001002                 INC     @#TEMP          ;CHECK RESULT
003466  001401                         BEQ     .+4
003470  000000                         HLT                     ;ERROR! MTPD FAILED

                                ;USER MODE
003472  010701                  T43:   SCOPE
003474  005037  177776                 CLR     @#PSW
003500  012703  177777                 MOV     #-1,R3
003504  012737  003544  000004         MOV     #T43A,@#ERRVEC
003512  012737  140000  177776         MOV     #UM,@#PSW
003520  012703  001004                 MOV     #TEMP+2,R3
003524  005067  175252                 CLR     TEMP
003530  012706  000700                 MOV     #UPTR,USP
003534  052716  177777                 BIS     #-1,(USP)
003540  006643                         MTPI    -(R3)                   ;-(R3)+(USP)+
003542  000401                         BR      .+4
003544  000000                  T43A:  HLT                             ;ERROR TRAPPED
003546  013700  177776                 MOV     @#PSW,R0
003552  042737  140000  177776         BIC     #UM,@#PSW               ;KERNEL MODE!!!
003560  122700  000010                 CMPB    #N,R0
003564  001401                         BEQ     .+4
003566  000000                         HLT
003570  005167  175206                 COM     TEMP
003574  001401                         BEQ     .+4
003576  000000                         HLT
003600  012737  000006  000004         MOV     #ERRVEC+2,@#ERRVEC
003606  005067  174174                 CLR     ERRVEC+2

                                ;TEST THAT MFP D/I PUSHES DESTINATION REGISTER DATA ONTO THE APPROPRIATE STACK
                                ;(AS DETERMINED BY @#PSW BITS 15 &14)
                                ;KERNEL MODE,MFPD
003612  010701                  T44:   SCOPE
003614  012706  000500                 MOV     #KPTR,KSP
003620  012716  125252                 MOV     #125252,(KSP)
003624  012700  177777                 MOV     #-1,R0
003630  000261                         SEC
003632  006500                         MFPI    R0                      ;-(KSP)+R0,(R0)=-1
003634  013702  177776                 MOV     @#PSW,R2                ;GET STATUS RESULT
003640  022702  000011                 CMP     #REG+N+C,R2             ;
003644  001401                         BEQ     .+4
003646  000000                         HLT                             ;ERROR! INCORRECT STATUS RESULT
003650  022706  000476                 CMP     #KPTR-2,KSP             ;DID KERNEL STACK POINTER GET
003654  001401                         BEQ     .+4                     ;PUSHED?
003656  000000                         HLT                             ;ERROR!
003660  005116                         COM     (KSP)                   ;TEST THAT CORRECT DATA(-1) GOT
003662  001401                         BEQ     .+4                     ;PUSHED ONTO KERNEL STACK
003664  000000                         HLT                             ;ERROR! -1NOT PUSHED ONTO KERNEL STACK
                                ;KERNEL MODE,MFPI
003666  010701                  T45:   SCOPE
003670  012706  000500                 MOV     #KPTR,KSP
003674  012716  052525                 MOV     #52525,(KSP)            ;PRE SET STACK
003700  005004                         CLR     R4                      ;PRESET 'WRONG' REGISTER
003702  012737  000001  177776         MOV     #REG+C,@#PSW            ;SELECT R0-R5,SET C
003710  012704  125252                 MOV     #125252,R4              ;LOAD DATA TO BE MOVED
003714  006504                         MFPI    R4                      ;-(KSP)+R4,(R4)=125252
```

```
003716  013700  177776          MOV     @#PSW,R0
003722  022700  000011          CMP     #REG+N+C,R0     ;CHECK STATUS RESULT
003726  001401                  BEQ     .+4
003730  000000                  HLT                     ;ERROR! INCORRECT STATUS
003732  022706  000476          CMP     #KPTR-2,KSP     ;CHECK PUSH
003736  001401                  BEQ     .+4
003740  000000                  HLT                     ;ERROR! KSP DID NOT PUSH DOWN
003742  022716  125252          CMP     #125252,(KSP)   ;CHECK DATA ON THE STACK
003746  001401                  BEQ     .+4
003750  000000                  HLT                     ;ERROR! INCORRECT DATA ON THE STACK
                                                        ;IF DATA=0 THEN INCORRECT REGISTER
                                                        ;(R4), IF DATA=52525 NO DATA PUSHED
                                                        ;ON THE STACK.

                        ;USER MODE,MFPD
003752  010701          T50:    SCOPE
003754  005003                  CLR     R3              ;PRESET
003756  012737  140000  177776  MOV     #UM,@#PSW       ;USER MODE, R0-R5
003764  012706  000700          MOV     #UPTR,USP       ;SET USER'S STACK POINTER
003770  012726  125252          MOV     #125252,(USP)+  ;PRESET STACK
003774  012703  177777          MOV     #-1,R3          ;
004000  000257                  CCC
004002  006503                  MFPI    R3              ;-(USP)+R3 (R3)=-1

004004  013700  177776          MOV     @#PSW,R0
004010  010604                  MOV     USP,R4
004012  042737  140000  177776  BIC     #UM,@#PSW
004020  022700  140010          CMP     #UM+N,R0
004024  001401                  BEQ     .+4
004026  000000                  HLT
004030  022704  000700          CMP     #UPTR,R4
004034  001401                  BEQ     .+4
004036  000000                  HLT
004040  005214                  INC     (R4)
004042  001401                  BEQ     .+4
004044  000000                  HLT
004046  005037  177776          CLR     @#PSW

                        ;USER MODE,MFPI
004052  010701          T51:    SCOPE
004054  005005                  CLR     R5
004056  012737  140000  177776  MOV     #UM,@#PSW       ;USER MODE!!!
004064  012706  000700          MOV     #UPTR,USP       ;SET USER STACK POINTER
004070  012716  177777          MOV     #-1 (USP)       ;PRESET USER STACK
004074  012705  000700          MOV     #UPTR,R5        ;PRESET R5
004100  000277                  SCC                     ;PRESET CONDITION CODES
004102  006505                  MFPI    R5              ;-(USP)+R5

004104  013700  177776          MOV     @#PSW,R0                ;GET STATUS RESULT
004110  010602                  MOV     USP,R2          ;GET USER STACK POINTER
004112  042737  140000  177776  BIC     #UM,@#PSW               ;KERNEL MODE!!!
004120  022700  140001          CMP     #UM+C,R0        ;CHECK STATUS RESULT AFTER MFPI INST
004124  001401                  BEQ     .+4
004126  000000                  HLT                     ;ERROR! INCORRECT STATUS AFTER MFPI
004130  022702  000676          CMP     #UPTR-2,R2
004134  001401                  BEQ     .+4
004136  000000                  HLT
004140  022712  000700          CMP     #UPTR,(R2)
```

```
004144  001401                          BEQ     .+4
004146  000000                          HLT
                                ;TEST THAT MFPD/I PUSHES DESTINATION MEMORY DATA ONTO THE APPROPPIATE
                                ;STACK.
                                ;KERNEL MODE,MFPD
004150  010701                  T52:    SCOPE
004152  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!
004156  012700  001002                  MOV     #TEMP,R0        ;PRESET R0
004162  052737  000000  177776          BIS     #REG,@#PSW      ;SELECT R0-R5
004170  012700  001004                  MOV     #TEMP+2,R0      ;PRESET R0
004174  012767  177777  174600          MOV     #-1,TEMP
004202  005067  174576                  CLR     TEMP+2
004206  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
004212  012716  125252                  MOV     #125252,(KSP)   ;PRESET KERNEL STACK
004216  006520                          MFPI    (R0)+           ;-(KSP)←(R0)+,R0=TEMP+2,TEMP+2=0

004220  013702  177776                  MOV     @#PSW,R2
004224  022702  000004                  CMP     #REG+2,R2
004230  001401                          BEQ     .+4
004232  000000                          HLT
004234  022706  000476                  CMP     #KPTR-2,KSP
004240  001401                          BEQ     .+4
004242  000000                          HLT
004244  005716                          TST     (KSP)
004246  001401                          BEQ     .+4
004250  000000                          HLT

                                ;USER MODE MFPI
004252  010701                  T54:    SCOPE
004254  012737  140000  177776          MOV     #UM,@#PSW
004262  012703  001004                  MOV     #TEMP+2,R3
004266  052737  000340  177776          BIS     #REG+PRTY7,@#PSW
004274  012703  001006                  MOV     #TEMP+4,R3
004300  005067  174476                  CLR     TEMP
004304  012767  177777  174472          MOV     #-1,TEMP+2
004312  012706  000700                  MOV     #UPTR,USP
004316  012716  125252                  MOV     #125252,(USP)
004322  006563  177776                  MFPI    -2(R3)          ;-(USP←-2(R3),R3=#TEMP+4,TEMP+2=-1

004326  013700  177776                  MOV     @#PSW,R0
004332  010602                          MOV     USP,R2
004334  042737  140000  177776          BIC     #UM,@#PSW
004342  022700  140350                  CMP     #UM+PRTY7+N,R0
004346  001401                          BEQ     .+4
004350  000000                          HLT
004352  022702  000676                  CMP     #UPTR-2,R2
004356  001401                          BEQ     .+4
004360  000000                          HLT
004362  005112                          COM     (R2)
004364  001401                          BEQ     .+4
004366  000000                          HLT
                                ;TEST OVERFLOW (YELLOW) USING MFPD INSTRUCTION
004370  010701                  T55:    SCOPE
004372  012737  030000  177776          MOV     #PUM,@#PSW      ;KERNEL MODE!!!,PREV USER MODE!!
004400  012706  001000                  MOV     #YELPTR,KSP     ;SET STACK PTR AT TOP OF YELLOW ZONE
004404  012767  177777  174370          MOV     #-1,TEMP        ;PRESET DATA
```

```
004412  005066  177776                  CLR     -2(KSP)         ;PRESET STACK DATA
004416  012737  004444  000004          MOV     #T55A,@#ERRVEC  ;LOAD ERROR TRAP VECTOR
004424  005037  000006                  CLR     @#ERRVEC+2
004430  012737  000400  177774          MOV     #400,@#SLR      ;SET STACK LIMIT =1000
004436  006567  174340                  MFPI    TEMP            ;PUSH TEMP ONTO KERNEL STACK
                                                                ;SHOULD OVERFLOW STACK
004442  000000                  T55AA:  HLT                     ;ERROR! FAILED TO TRAP ON OVERFLOW
004444  022767  177777  174324  T55A:   CMP     #-1,YELPTR-2    ;CHECK THAT MFPD PUSHED DATA
004452  001401                          BEQ     .+4             ;ONTO STACK
004454  000000                          HLT                     ;ERROR! MTPD FAILED TO PUSH DATA
004456  022767  030010  174310          CMP     #PUM+N,YELPTR-4 ;CHECK SAVED STATUS ON TRAP
004464  001401                          BEQ     .+4
004466  000000                          HLT                     ;ERROR! INCORRECT STATUS SAVED
004470  022767  004442  174274          CMP     #T55AA,YELPTR-6 ;CHECK SAVED PC ON STACK
004476  001401                          BEQ     .+4
004500  000000                          HLT                     ;ERROR! INCORRECCT PC SAVED ON STACK
004502  005037  177774                  CLR     @#SLR           ;CLEAR STACK LIMIT REGISTER

                                ;TEST OVERFLOW (RED) USING MFPI INSTRUCTION
004506  010701                  T56:    SCOPE
004510  012737  004562  000004          MOV     #T56A,@#ERRVEC  ;SET ERROR TRAP VECTOR
004516  012737  030340  177776          MOV     #PUM+PRTY7,@#PSW        ;KERNEL MODE!!!, PREV USER MODE!!
004524  012706  000736                  MOV     #REDPTR,KSP     ;SET STACK PTR TO TOP OF RED ZONE
004530  012766  177777  177776          MOV     #-1,-2(KSP)     ;PRESET RED LOCATION=-1
004536  005067  174240                  CLR     TEMP            ;(TEMP)WILL BE THE DATA MOVED
                                                                ;TO RED LOCATION
004542  012703  001004                  MOV     #TEMP+2,R3      ;LOAD INDEX REGISTER
004546  012737  000400  177774          MOV     #400,@#SLR      ;SET STACK LIMIT=1000
004554  006563  177776                  MFPI    -2(R3)          ;-(KSP)←TEMP SHOULD OVER
                                                                ;FLOW (RED)
004560  000000                  T56AA:  HLT                     ;ERROR! FAILED TO TRAP ON 'RED'
                                                                ;OVERFLOW
004562  022737  177777  000734  T56A:   CMP     #-1,@#REDPTR-2  ;TEST THAT MFPI DID NOT WRITE
004570  001401                          BEQ     .+4             ;INTO 'RED' LOCATION
004572  000000                          HLT                     ;ERROR!
004574  005706                          TST     KSP             ;STACK SHOULD HAVE GONE TO 0
004576  001401                          BEQ     .+4
004600  000000                          HLT
004602  022737  030344  000002          CMP     #PUM+PRTY7+Z,@#2 ;OLD STATUS SHOULD BE IN 2
004610  001401                          BEQ     .+4
004612  000000                          HLT                     ;ERROR!
004614  022737  004560  000000          CMP     #T56AA,@#0      ;AND RETURN IN 0
004622  001401                          BEQ     .+4
004624  000000                          HLT                     ;ERROR! INCORRECT PC IN 0
004626  005037  177774                  CLR     @#SLR
004632  012737  000006  000004          MOV     #ERRVEC+2,@#ERRVEC;RESTORE ERROR VECTOR

                                ;TEST TRAP & RETURN USER-KERNEL-USER
004640  010701                  T57:    SCOPE
004642  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
004646  012737  000340  000036          MOV     #PRTY7,@#TRAPVEC+2
004654  012737  004744  000034          MOV     #T57A,@#TRAPVEC
004662  012737  140000  177776          MOV     #UM,@#PSW       ;USER MODE!!!
004670  005002                          CLR     R2
004672  104400                          TRAP                    ;TRAP & ENTER KERNEL MODE
004674  013767  177776  174100  T57AA:  MOV     @#PSW,TEMP
```

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004702  042737  140000  177776          BIC     #UM,@#PSW               ;KERNEL MODE!!!
004710  022767  004674  173556          CMP     #T57AA,KPTR-4   ;CHECK THAT RETURN ADDRESS IS ON
004716  001401                          BEQ     .+4             ;KERNEL STACK
004720  000000                          HLT                     ;ERROR!RETURN ADDRESS NOT ON STACK
004722  022767  140004  174052          CMP     #UM+Z,TEMP      ;CHECK THAT CORRECT @#PSW WAS
004730  001401                          BEQ     .+4             ;RESTORED ON THE RETURN
004732  000000                          HLT                     ;ERROR! INCORRECT STATUS WAS RETURNED
                                                                ;BY KERNEL FROM TRAP
004734  005102                          COM     R2              ;CHECK THAT TRAP ROUTINE WAS EXECUTED
004736  001401                          BEQ     .+4
004740  000000                          HLT                     ;ERROR! KERNEL DID NOT DO COM R2
                                                                ;(AT T57A)
004742  000402                          BR      T57EX           ;EXIT TEST
004744  005102          T57A:   COM     R2                      ;COMPLEMENT R2
004746  000002                          RTI                     ;AND EXIT
004750  000240          T57EX:  NOP

                        ;TEST THAT MFPD/I CAN PUSH ONTO CURRENT STACK (AS DETERMINED BY PS15 &
                        ;PS14) THE PREVIOUS MODES STACK POINTER (AS DETERMINED BY PS13 &PS12)
                        ;-(KSP)←KSP,MFPD
004752  010701          T60:    SCOPE
004754  005037  177776          CLR     @#PSW                   ;KERNEL MODE!!!, PREV KERNEL MODE!!
004760  012706  000500          MOV     #KPTR,KSP               ;SET KERNEL STACK POINTER
004764  006506                  MFPI    KSP                     ;-(KSP)←KSP
004766  022767  000500  173502  CMP     #KPTR,KPTR-2    ;TEST THAT VALUE OF KERNEL STACK POINTER
004774  001401                  BEQ     .+4             ;WAS PUSHED ONTO KERNEL STACK
004776  000000                  HLT                     ;ERROR!

                        ;-(KSP)←USP,MFPD
005000  010701          T62:    SCOPE
005002  012737  030000  177776  MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!, PREV USER MODE!!
005010  012706  000500          MOV     #KPTR,KSP               ;SET KERNEL STACK POINTER
005014  012716  177777          MOV     #-1,(KSP)
005020  006606                  MTPI    USP                     ;SET USER STACK POINTER USP←(KSP)+
005022  005166  177776          COM     -2(KSP)                 ;PRESET KERNEL STACK
005026  006506                  MFPI    USP                     ;-(KSP)←USP
005030  022716  177777          CMP     #-1,(KSP)               ;CHECK THAT USER STACK POINTER WAS
005034  001401                  BEQ     .+4                     ;PUSHED ONTO KERNEL STACK
005036  000000                  HLT                             ;ERROR!

                        ;-(USP)←USP,MFPD
005040  010701          T65:    SCOPE
005042  012737  030000  177776  MOV     #PUM,@#PSW              ;KERNEL MODE!!!, PREV USER MODE!!
005050  012706  000500          MOV     #KPTR,KSP               ;SET KERNEL STACK POINTER
005054  012716  000700          MOV     #UPTR,(KSP)
005060  006606                  MTPI    USP                     ;SET USER STACK POINTER
005062  005067  173610          CLR     UPTR-2
005066  052737  140000  177776  BIS     #UM,@#PSW                       ;USER MODE!!!, PREV USER MODE!!!
005074  006506                  MFPI    USP                     ;PUSH USER STACK POINTER ONTO USER STACK
005076  042737  140000  177776  BIC     #UM,@#PSW                       ;KERNEL MODE!!!, PREV USER MODE!!
005104  006506                  MFPI    USP                     ;PUSH USER STACK POINTER ONTO KERNEL STACK
005106  022716  000676          CMP     #UPTR-2,(KSP)   ;CHECK THAT USER STACK POITER WAS
005112  001401                  BEQ     .+4             ;PUSHED PROPERLY (ONCE)
005114  000000                  HLT                     ;ERROR!
005116  022767  000700  173552  CMP     #UPTR,UPTR-2    ;CHECK THAT USER STACK POINTER IS ON THE
005124  001401                  BEQ     .+4             ;USERS STACK
```

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005126  000000                          HLT                     ;ERROR!

                                ;-(KSP)←KSP,MFPI
                        T66:    SCOPE
005130  010701
005132  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!!, PREV KERNEL MODE!!
005136  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
005142  006506                          MFPI    KSP             ;PUSH KERNEL STACK POINTER ONTO KERNEL
                                                                ;STACK
005144  022767  000500  173324          CMP     #KPTR,KPTR-2    ;CHECK RESULT
005152  001401                          BEQ     .+4
005154  000000                          HLT                     ;ERROR!

                                ;-(KSP)←USP,MFPI
                        T70:    SCOPE
005156  010701
005160  012737  030000  177776          MOV     #PUM,@#PSW      ;KERNEL MODE!!!, PREV USER MODE!!
005166  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
005172  012716  177777                  MOV     #-1,(KSP)
005176  006606                          MTPI    JSP             ;SET USER STACK POINTER
005200  005166  177776                  COM     -2(KSP)         ;PRESET KERNEL STACK
005204  006506                          MFPI    USP             ;PUSH USER STACK POINTER ONTO KERNEL STACK
005206  022716  177777                  CMP     #-1,(KSP)       ;CHECK RESULT
005212  001401                          BEQ     .+4
005214  000000                          HLT                     ;ERROR! USER STACK POINTER NOT ON KERNEL STACK

                                ;-(USP)←USP,MFPI
005216  010701                  T73:    SCOPE
005220  012737  030000  177776          MOV     #PUM,@#PSW      ;KERNEL MODE!!!, PREV USER MODE!!
005226  012706  000500                  MOV     #KPTR,KSP               ;SET KERNEL STACK POINTER
005232  012716  000700                  MOV     #UPTR,(KSP)
005236  006606                          MTPI    USP             ;SET USER STACK POINTER
005240  005067  173432                  CLR     UPTR-2          ;PRESET USER STACK
005244  052737  140000  177776          BIS     #UM,@#PSW               ;USER MODE!!!, PREV USER MODE!!
005252  006506                          MFPI    USP             ;-(USP)←USP
005254  042737  140000  177776          BIC     #UM,@#PSW               ;KERNEL MODE!!!
005262  006506                          MFPI    USP             ;GET USER STACK POINTER
005264  022716  000676                  CMP     #UPTR-2,(KSP)   ;CHECK THAT USER STACK POINTER WAS
005270  001401                          BEQ     .+4             ;PUSHED ONCE
005272  000000                          HLT                     ;ERROR!
005274  022767  000700  173374          CMP     #UPTR,UPTR-2    ;CHECK THAT USER STACK POINTER WAS PUSHED
005302  001401                          BEQ     .+4             ;ONTO USER STACK
005304  000000                          HLT                     ;ERROR!

                                ;TEST THAT ILLEGAL MODE DOES NOT HANG BUS.
005306  010701                  T74:    SCOPE
005310  012737  100000  177776          MOV     #IM,@#PSW               ;ILLEGAL MODE!!!
005316  013700  177776                  MOV     @#PSW,R0                ;GET ILLEGAL MODE
005322  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!
005326  022700  100000                  CMP     #IM,R0          ;CHECK THAT ILLEGAL MODE WAS SET
005332  001401                          BEQ     .+4             ;INTO STATUS
005334  000000                          HLT

                                ;TEST THAT ILLEGAL MODE DOES NOT HANG BUS.
005336  010701                  T75:    SCOPE
005340  012737  040000  177776          MOV     #IM1,@#PSW              ;ILLEGAL MODE!!!
005346  013700  177776                  MOV     @#PSW,R0                ;GET ILLEGAL MODE
005352  005037  177776                  CLR     @#PSW           ;KERNEL MODE!!
```

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005356  022700  040000                  CMP     #IM1,R0         ;CHECK THAT ILLEGAL MODE WAS SET
005362  001401                          BEQ     .+4             ;INTO STATUS
005364  000000                          HLT

                                ;TEST THAT KERNEL CAN GET DATA FROM USER STACK
005366  010701                  T76:    SCOPE
005370  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!, PREV USER MODE!!
005376  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK POINTER
005402  012716  000700                  MOV     #UPTR,(KSP)
005406  006606                          MTPI    USP             ;SET USER STACK POINTER
005410  005067  173264                  CLR     UPTR            ;PRESET USER STACK
005414  005016                          CLR     (KSP)           ;PRESET KERNEL STACK
005416  012766  177777  177776          MOV     #-1,-2(KSP)
005424  006506                          MFPI    USP             ;-(KSP)←USP
005426  006576  000000                  MFPI    @(KSP)          ;LIKE MOV  @(6),-(6)
005432  000240                          NOP
005434  013703  177776                  MOV     @#PSW,R3                ;SAVE STATUS RESULT
005440  022767  000700  173032          CMP     #UPTR,KPTR      ;CHECK THAT USER STACK POINTER WAS
005446  001401                          BEQ     .+4             ;PUSHED ONTO KERNEL STACK
005450  000000                          HLT                     ;ERROR!
005452  022706  000476                  CMP     #KPTR-2,KSP     ;CHECK THAT KERNEL STACK POINTER IS POS-
005456  001401                          BEQ     .+4             ;ITIONED PROPERLY
005460  000000                          HLT                     ;ERROR! INCORRECT KERNEL STACK POINTER
005462  005716                          TST     (KSP)           ;CHECK THAT CORRECT DATA
005464  001401                          BEQ     .+4             ;WAS PUSHED ONTO KERNEL STACK
005466  000000                          HLT                     ;ERROR!
005470  022703  030004                  CMP     #KM+PUM+Z,R3    ;CHECK STATUS
005474  001401                          BEQ     .+4
005476  000000                          HLT                     ;ERROR! INCORRECT STATUS

                                ;CHECK THAT MTPD CAN LOAD MEMORY ADDRESS DM=7,PC
005500  010701                  T102:   SCOPE
005502  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!, PREV USER MODE!!
005510  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
005514  005016                          CLR     (KSP)           ;PUT DATA ON STACK
005516  012737  001002  001004          MOV     #TEMP,@#TEMP+2  ;LOAD ADDRESS
005524  012767  177777  173250          MOV     #-1,TEMP        ;PRESET DATA
005532  000277                          SCC                     ;PRESET CC'S
005534  006677  173244                  MTPI    @TEMP+2         ;TEMP←(KSP)+
005540  013703  177776                  MOV     @#PSW,R3                ;CHECK CC'S
005544  022703  030005                  CMP     #PUM+Z+C,R3     ;CHECK CC'S
005550  001401                          BEQ     .+4
005552  000000                          HLT                     ;ERROR! INCORRECT CC'S AFTER MTPD
005554  005737  001002                  TST     @#TEMP          ;CHECK RESULT
005560  001401                          BEQ     .+4
005562  000000                          HLT                     ;ERROR! INCORRECT RESULT

                                ;CHECK THAT MTPI CAN LOAD MEMORY ADDRESS DM=7
005564  010701                  T103:   SCOPE
005566  012737  030000  177776          MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!
005574  012706  000500                  MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
005600  012716  177777                  MOV     #-1,(KSP)       ;LOAD DATA ONTO STACK
005604  012704  177776                  MOV     #-2,R4          ;LOAD INDEX REGISTER
005610  005067  173166                  CLR     TEMP            ;PRESET DATA
005614  012767  001002  173162          MOV     #TEMP,TEMP+2
005622  006674  001006                  MTPI    @TEMP+4(R4)     ;TEMP←(KSP)+
```

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005626  013703  177776          MOV     @#PSW,R3                ;SAVE STATUS RESULT
005632  022706  000502          CMP     #KPTR+2,KSP     ;CHECK THAT KSP POPPED
005636  001401                  BEQ     .+4
005640  000000                  HLT                             ;ERROR! INCORRECT STACK PTR
005642  022703  030010          CMP     #PUM+N,R3       ;CHECK STATUS RESULT
005646  001401                  BEQ     .+4
005650  000000                  HLT                             ;ERROR! INCORRECT STATUS
005652  005267  173124          INC     TEMP            ;CHECK RESULT
005656  001401                  BEQ     .+4
005660  000000                  HLT                             ;ERROR! INCORRECT RESULT

                        ;TEST THAT MTPD/I CAN LOAD PC
005662  010701          T104:   SCOPE
005664  012737  000000  177776  MOV     #KM,@#PSW       ;KERNEL MODE!!!
005672  012706  000500          MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
005676  012716  005710          MOV     #T104A,(KSP)    ;PUT NEW PC ON STACK
005702  000277                  SCC                     ;PRESET CC'S
005704  006607                  MTPI    PC              ;PC<-(KSP)+
005706  000000                  HLT                     ;ERROR! MTPD FAILED TO SET PC
005710  100001          T104A:  BPL     .+4
005712  000000                  HLT                     ;ERROR! 'N' FAILED TO CLEAR IN STATUS
005714  103401                  BCS     .+4
005716  000000                  HLT                     ;ERROR! 'C' WAS CLEARED BY MTPD

                        ;USER MODE
005720  010701          T106:   SCOPE
005722  012737  170000  177776  MOV     #UM+PUM,@#PSW   ;USER MODE!!!
005730  012706  000700          MOV     #UPTR,USP       ;SET USER STACK PTR
005734  012716  005752          MOV     #T106A,(USP)    ;PUT NEW PC ON STACK
005740  000277                  SCC                     ;PRESET CC'S
005742  006607                  MTPI    PC              ;PC<-(USP)+
005744  005037  177776          CLR     @#PSW           ;KERNEL MODE!!!
005750  000000                  HLT                     ;ERROR! MTPD FAILED TOMLOAD PC
005752  013705  177776  T106A:  MOV     @#PSW,R5                ;SAVE STATUS
005756  005037  177776          CLR     @#PSW           ;KERNEL MODE!!!
005762  022705  170001          CMP     #UM+PUM+C,R5    ;CHECK STATUS
005766  001401                  BEQ     .+4
005770  000000                  HLT

                        ;TEST ERROR TRAP (ODD ADDRESS) MFPD/I
005772  010701          T107:   SCOPE
005774  005037  177776          CLR     @#PSW           ;KERNEL MODE!!!
006000  012706  000500          MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
006004  012737  006022  000004  MOV     #T107A,@#ERRVEC ;LOAD ERRROR VECTOR
006012  000277                  SCC                     ;PRESET CC'S
006014  006567  171761          MFPI    1               ;ODD ADDRESS SHOULD TRAP
006020  000000          T107AA: HLT                     ;ERROR! FAILED TO TRAP ON ODD ADDRESS
006022  022706  000474  T107A:  CMP     #KPTR-4,KSP     ;CHECK THAT STACK PTR WAS PUSHED
006026  001401                  BEQ     .+4             ;PROPERLY (2 PUSHES)
006030  000000                  HLT                     ;ERROR! INCORRECT STACK PTR AFTER ERROR
006032  022726  006020          CMP     #T107AA,(KSP)+  ;CHECK RETURN PC ON STACK
006036  001401                  BEQ     .+4
006040  000000                  HLT                     ;ERROR! RETURN PC NOT ON STACK
006042  022716  000017          CMP     #17,(KSP)       ;CHECK SAVED STATUS ON STACK
006046  001401                  BEQ     .+4
006050  000000                  HLT                     ;ERROR! INCORRECT STATUS SAVED ON STACK
```

```
                                        ;USER MODE, TIME OUT
006052  010701                          T110:   SCOPE
006054  012737  140000  177776                MOV     #UM,@#PSW               ;USER MODE!!!
006062  012706  000700                        MOV     #UPTR,USP       ;SET USER STACK
006066  012737  140000  000006                MOV     #UM,@#ERRVEC+2  ;LOAD 'NEW' STATUS
006074  012737  006114  000004                MOV     #T110A,@#ERRVEC ;AND PC
006102  006537  177702                        MFPI    @#177702        ;177702 IS NON-EXISTANT ADRS
006106  005037  177776          T110AA: CLR     @#PSW           ;KERNEL MODE!!!
006112  000000                          HLT                     ;ERROR! DID NOT TRAP ON NON ADRS
006114  010603                  T110A:  MOV     USP,R3          ;SAVE USER STACK PTR
006116  042737  140000  177776                BIC     #UM,@#PSW               ;KERNEL MODE!!!
006124  022703  000674                        CMP     #UPTR-4,R3      ;CHECK USER STACK PTR
006130  001401                          BEQ     .+4
006132  000000                          HLT                     ;ERROR! INCORRECT USP AFTER ERROR TRAP
006134  022723  006106                        CMP     #T110AA,(R3)+   ;CHECK RETURN PC ON USER STACK
006140  001401                          BEQ     .+4
006142  000000                          HLT                     ;ERROR! RETURN PC NOT ON USER STACK
006144  022713  140000                        CMP     #UM,(R3)        ;CHECK SAVED STATUS
006150  001401                          BEQ     .+4
006152  000000                          HLT                     ;ERROR! INCORRECT STATUS SAVED ON STACK

                                        ;USER MODE,ODD ADDRESS
006154  010701                          T111:   SCOPE
006156  012737  140000  177776                MOV     #UM,@#PSW       ;USER MODE!!!
006164  012706  000700                        MOV     #UPTR,USP       ;SET USER STACK PTR
006170  012737  006216  000004                MOV     #T111A,@#ERRVEC ;LOAD ERROR TRAP VECTOR
006176  012737  140000  000006                MOV     #UM,@#ERRVEC+2
006204  006567  171567                        MFPI    -1              ;ODD ADDRESS SHOULD TRAP
006210  005037  177776          T111AA: CLR     @#PSW           ;KERNEL MODE!!!
006214  000000                          HLT                     ;ERROR! FAILED TO TRAP
006216  010603                  T111A:  MOV     USP,R3          ;SAVE USER STACK PTR
006220  042737  140000  177776                BIC     #UM,@#PSW               ;KERNEL MODE!!!
006226  022703  000674                        CMP     #UPTR-4,R3      ;CHECK USER STACK PTR
006232  001401                          BEQ     .+4
006234  000000                          HLT                     ;ERROR! INCORRECT USER STACK POINTER
006236  022713  006210                        CMP     #T111AA,(R3)    ;CHECK RETURN SDDRESS ON USER STACK
006242  001401                          BEQ     .+4
006244  000000                          HLT                     ;ERROR! RETURN PC NOT ON USER STACK
006246  012737  000006  000004                MOV     #ERRVEC+2,@#ERRVEC;RESTORE ERROR TRAP TO HALT
006254  005067  171526                        CLR     ERRVEC+2

                                        ;TEST THAT MTPD INSTRUCTION CAN LOAD DATA TO AN ADDRESS VIA THE STACK
                                        ;KERNEL MODE,PREVIOUS USER MODE
006260  010701                          T112:   SCOPE
006262  012737  030000  177776                MOV     #KM+PUM,@#PSW   ;KERNEL MODE!!!, PREV USER MODE!!
006270  012706  000500                        MOV     #KPTR,KSP       ;SET KERNEL STACK PTR
006274  012746  000700                        MOV     #UPTR,-(KSP)
006300  006606                          MTPI    USP             ;SET USER STACK PTR
006302  012746  001002                        MOV     #TEMP,-(KSP)    ;PUT ADDRESS ON THE STACK
006306  012746  177777                        MOV     #-1,-(KSP)      ;PUT DATA ON THE STAK
006312  005037  001002                        CLR     @#TEMP          ;PRESET DATA
006316  006636                          MTPI    @(KSP)+         ;MOVE #-1 TO TEMP
006320  022706  000500                        CMP     #KPTR,KSP       ;CHECK STACK PTR AFTER MTPD
006324  001401                          BEQ     .+4
006326  000000                          HLT                     ;ERROR! INCORRECT STACK PTR AFTER MTPD
006330  005267  172446                  INC     TEMP            ;CHECK THAT DATA WAS MOVED TO TEMP
```

```
006334  001401                          BEQ     .+4
006336  000000                          HLT                     ;ERROR! DATA NOT IN TEMP
006340  006506                          MFPI    USP             ;GET USER STACK PTR
006342  022716  000700                  CMP     #UPTR,(SP)      ;CHECK THAT USER STACK PTR NOT CHANGED
006346  001401                          BEQ     .+4             ;BY MTPD INSTRUCTION
006350  000000                          HLT                     ;ERROR! USP WAS CHANGED BY MTPD INST.

006352  005267  172422          END:    INC     ICNT            ;INCREMENT PASS COUNT
006356  026727  172416  000144          CMP     ICNT,#100.      ;100 PASSES COMPLETED?
006364  001402                          BEQ     DONE
006366  000167  172440                  JMP     BEGIN
006372  032767  010000  171170  DONE:   BIT     #10000,SWR              ;INHIBIT BELL?
006400  001401                          BEQ     .+4
006402  000414                          BR      LOGICT
006404  012767  000007  171154          MOV     #7,TPB          ;RING BELL
006412  105767  171146                  TSTB    TPS
006416  100375                          BPL     .-4
006420  012767  000177  171140          MOV     #177,TPB
006426  105767  171132                  TSTB    TPS
006432  100375                          BPL     .-4
006434  013701  000042          LOGICT: MOV     @#42,%1         ;RETURN TO MONITOR?
006440  001410                          BEQ     LOGICE
006442  000005                          RESET
006444  004711                  LOGIC:  JSR     7,(1)           ;RETURN!
006446  000240                          NOP
006450  000240                          NOP
006452  000240                          NOP
006454  005000                  1$:     CLR     R0
006456  005200                          INC     R0
006460  001375                          BNE     1$
006462  000167  172324          LOGICE: JMP     START
        000001                          .END
```

```
BEGIN   001032          401#  1356
BIT13 = 020000          232#
BIT14 = 040000          231#
BIT15 = 100000          230#
BIT6  = 000100          233#
C     = 000001          245#   605   609   652   880   894   899   947  1218  1269
DONE    006372         1355  1357#
EMTVEC= 000030          209#
END     006352         1353#
ERRVEC= 000004          207#   559*  772*  773*  789*  790*  813*  814*  830*  850*  867*  868*  1011*
                       1012*  1030*  1055*  1277*  1294*  1295*  1315*  1316*  1328*  1329*
HLT   = 000000          199#   411   424   429   432   435   438   444   455   461   464   482   485
                        494   499   502   514   524   539   545   548   551   589   592   611   614
                        617   632   635   638   654   657   660   678   681   684   704   707   717
                        732   735   750   763   775   778   781   793   796   801   804   807   821
                        823   826   837   841   844   858   863   866   882   885   888   901   904
                        907   926   929   932   949   952   955   973   976   979   998  1001  1004
                       1016  1019  1022  1025  1040  1044  1047  1050  1053  1069  1072  1076  1092
                       1104  1119  1122  1132  1144  1159  1162  1171  1180  1197  1200  1203  1206
                       1220  1223  1237  1240  1243  1252  1254  1256  1266  1271  1280  1283  1286
                       1289  1298  1303  1306  1309  1319  1324  1327  1344  1347  1351
ICNT    001000          391#   396*  1353*  1354
IM    = 100000          238#  1166  1169
IM1   = 040000          239#  1175  1178
IOTVEC= 000020          211#   417*   418*   445*
KM    = 000000          240#   398   427   460   497   533   543   692   741  1096  1184  1204  1210
                       1227  1247  1334
KPTR  = 000500          224#   395   401   416   430   433   436   473   483   490   500   530   546
                        549   602   612   623   633   693   705   712   770   776   779   831   874
                        883   891   902   966   974  1059  1067  1088  1090  1097  1109  1127  1130
                       1137  1149  1185  1195  1198  1211  1228  1235  1248  1276  1281  1335  1342
LOGIC   006444          382  1369#
LOGICE  006462         1367  1376#
LOGICT  006434         1359  1366#
N     = 000010          248#   605   630   652   799   839   861   880   899   924   996  1020  1238
PKM   = 000000C         242#   398
PRTY3 = 000140          202#   549
PRTY4 = 000200          203#   533   535   543
PRTY7 = 000340          204#   419   433   508   519   531   985   996  1031  1048  1060
PSW   = 177776          216#   398   405*   407   408*   419*   423*   425   426*   439*   441*   451*   454*
                        456   458*   474*   476*   478   479*   491*   493*   495   496*   507*   508*   511*
                        519*   526*   531*   535*   538*   540   542*   558*   570*   586*   591*   601*   605*
                        608   622*   626*   629   642*   649   651*   665*   672   675*   690*   692*   698
                        699*   701*   721*   727   729*   739*   741*   745*   747*   754*   760*   769*   785*
                        792*   795*   811*   815*   838   848*   851*   859   860*   879   894*   898   914*
                        921   923*   933*   937*   944   946*   960*   962*   970   983*   985*   993   995*
                       1007*  1031*  1062*  1065  1066*  1087*  1096*  1108*  1113*  1115*  1126*  1136*  1148*
                       1153*  1155*  1166*  1167  1168*  1175*  1176  1177*  1184*  1194  1210*  1217  1227*
                       1234  1247*  1260*  1265*  1267  1268*  1275*  1292*  1297*  1300*  1313*  1318*  1321*
                       1334*
PUM   = 030000          241#   427   462   480   497   531   543   549   605   609   626   630   692
                        721   730   741   754   785   799  1007  1020  1031  1048  1096  1108  1136
                       1148  1184  1204  1210  1218  1227  1238  1260  1269  1334
PWRUP   001022          398#
RECPTR= 000736          227#   713   715  1032  1042
REG   = 000000          243#   570   815   839   880   894   899   962   971   985
```

```
RESVEC= 000010  208#  471*  472*  489*  503*
SCOPE = 010701  200#  404   415   448   470   488   506   518   529   556   600   621   641
                664   689   711   720   738   753   768   784   810   829   847   873   890
                912   935   959   982  1006  1029  1058  1086  1095  1107  1125  1135  1147
               1165  1174  1183  1209  1226  1246  1259  1274  1291  1312  1333
SLR   = 177774  217#  557*  593*  1013*  1026*  1037*  1054*
START   001012  386   395#  1376
SUR   = 177570  222#  1357
TBIT  = 000020  244#
TBITVE= 000014  212#
TEMP    001002  392#  561*  563*  564*  566*  567*  569*  572*  573*  576*  577*  579*  580*
                584*  585*  587   834*  842*  852   853*  864*  961   963   964*  965*  984
                986   987*  988*  1009*  1014  1034*  1036  1065*  1070  1213*  1214*  1216*  1221
               1231*  1232*  1233*  1241*  1338  1340*  1345*
TKB   = 177562  219#
TKS   = 177560  218#
TPB   = 177566  221#  1360*  1363*
TPS   = 177564  220#  1361   1364
TPVEC = 000064  214#
TRAPVE= 000034  210#  581*  582*  594*  595*  1060*  1061*
TRT   = 000003  201#  453
TRTVEC= 000014  213#  449*  450*  465*  466*
T1      001036  404#
T102    005500  1209#
T103    005564  1226#
T104    005662  1246#
T104A   005710  1249  1253#
T106    005720  1259#
T106A   005752  1262  1267#
T107    005772  1274#
T107A   006022  1277  1281#
T107AA  006020  1280#  1284
T110    006052  1291#
T110A   006114  1295  1299#
T110AA  006106  1297#  1304
T111    006154  1312#
T111A   006216  1315  1320#
T111AA  006210  1318#  1325
T112    006260  1333#
T12     001352  470#
T12A    001410  471   478#
T12AA   001402  476#  483
T13     001442  488#
T13A    001474  489   495#
T13AA   001466  493#  500
T15     001640  529#
T15A    001720  532   540#
T15AA   001712  538#  546
T17     002002  556#
T17A    002036  562#
T17B    002050  562   564#
T17C    002070  565   567#
T17D    002126  571   573#
T17E    002150  574   577#
T17EAF  002250  559   591#
T17F    002170  578   580#
```

```
T17G    002222          581     585#
T17X    002256          590     593#
T18     001534          506#
T19     001576          518#
T21     002274          600#
T22     002356          621#
T25     002440          641#
T26     002530          664#
T30     002620          689#
T31     002714          711#
T31C    002740          720#
T32A    003012          738#
T35     003062          753#
T36     003122          768#
T36A    003160          772     776#
T36AA   003156          775#    779
T40     003202          784#
T40A    003252          789     794#
T40AA   003244          792#    802
T41     003326          810#
T41A    003374          813     821#
T41B    003414          829#
T41BB   003444          830     837#
T43     003472          847#
T43A    003544          850     858#
T44     003612          873#
T45     003666          890#
T5      001070          415#
T5A     001134          417     425#
T5AA    001126          423#    430
T5C     003752          912#
T51     004052          935#
T52     004150          959#
T54     004252          982#
T55     004370         1006#
T55A    004444         1011    1017#
T55AA   004442         1016#   1023
T56     004506         1029#
T56A    004562         1030    1042#
T56AA   004560         1040#   1051
T57     004640         1058#
T57A    004744         1061    1079#
T57AA   004674         1065#   1067
T57EX   004750         1078    1081#
T60     004752         1086#
T62     005000         1095#
T65     005040         1107#
T66     005130         1125#
T7      001242          448#
T7A     001302          449     456#
T7AA    001274          454#    459
T70     005156         1135#
T73     005216         1147#
T74     005306         1165#
T75     005336         1174#
T76     005366         1183#
```

```
.UM     = 140000        237* 405  409  419  433  439  450  451  453  462  474  491  519
                        531  549  558  582  642  652  665  676  690  699  721  730  739
                        745  754  795  790  795  795  851  860  914  923  924  937  946
                        947  983  995  996 1062 1066 1070 1113 1115 1153 1155 1260 1269
                       1292 1294 1300 1307 1313 1316 1321
.UPTF   = 000700        225* 420  442  452  459  534  560  643  655  666  679  694  702
                        722  755  756  761  787  796  799  802  854  915  927  938  940
                        950  953  989  999 1110 1112* 1117 1120 1150 1152* 1157 1160 1186
                       1188* 1195 1261 1293 1301 1314 1322 1336 1349
.       = 000002        246*  626
.E_PTR  = 001000        226* 1008 1017 1020 1023
.       = 000024        247*  609  626  676  730  971 1048 1070 1204 1218
.       = 006466        251*  252  254  256  258  260  262  264  266  268  270  272  274
                        276   278  280  282  284  286  288  290  292  294  296  298  300
                        302   304  306  308  310  312  314  316  318  320  322  324  326
                        328   330  332  334  336  338  340  342  344  346  348  350  352
                        354   356  358  360  362  364  366  368  370  372  374  376  378
                        381*  383* 385* 388* 393* 399  410  428  431  434  437  443  460
                        463   481  484  498  501  513  523  544  547  550  588  610  613
                        616   631  634  637  653  656  659  677  680  683  703  706  716
                        731   734  749  762  777  780  797  800  803  806  820  822  825
                        836   840  843  857  862  865  881  884  887  900  903  906  925
                        928   931  948  951  954  972  975  978  997 1000 1003 1018 1021
                       1024 1043 1046 1049 1052 1068 1071 1075 1091 1103 1118 1121 1131
                       1143 1158 1161 1170 1179 1196 1199 1202 1205 1219 1222 1236 1239
                       1242 1253 1255 1270 1282 1285 1288 1302 1305 1308 1323 1326 1343
                       1346 1350 1358 1362 1365
```

F03


```
COMMEN    1#
ENDCOM    1#
ESCAPE    1#
GETPRI    1#
GETSWR    1#
MULT      1#
NEWTST    1#
POP       1#
PUSH      1#
REPORT    1#
SETPRI    1#
SETUP     1#
SKIP      1#
SLASH     1#
STARS     1#
SWRSU     1#
TYPBIN    1#
TYPDEC    1#
TYPNAM    1#
TYPNUM    1#
TYPOCS    1#
TYPOCT    1#
TYPTXT    1#
$$ESCA    1#
$$NEWT    1#
$$SKIP    1#
.EQUAT    1#
.HERDE    1#
.KT11     1#
.SETUP    1#
.SWRHI    1#
.$ACTI    1#
.$APTB    1#
.$APTH    1#
.$APTY    1#
.$ASTA    1#
.$CATC    1#
.$CMTA    1#
.$DB2D    1#
.$DB2C    1#
.$DIV     1#
.$EOP     1#
.$ERRO    1#
.$ERRT    1#
.$MULT    1#
.$POWE    1#
.$RAND    1#
.$RDDE    1#
.$RDOC    1#
.$READ    1#
.$R2AZ    1#
.$SAVE    1#
.$SB2D    1#
.$SB2O    1#
.$SCOP    1#
.$SIZE    1#
```

```
.$SUPR      1#
.$TRAP      1#
.$TYPB      1#
.$TYPC      1#
.$TYPE      1#
.$TYPO      1#
.$40CA      1#
.1170       1#


. ABS.  006466     000


 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 .DBKTDB.SEQ/CRF/SOL/NL:TOC=DSKZ:SYSMAC.SML,DBKTDB.P11
 RUN-TIME:  23 27 1 SECONDS
 RUN-TIME RATIO: 188/52=3.5
 CORE USED:  32K  (63 PAGES)
```

Spooler runtime 5 Seconds, 25 KCS, 110 disk reads, 3 disk writes, 32 pages

[redacted]