# KE11-F

INSTR TEST

## MD-11-DBKEA-B

EP DBKEA-B-DL-A



FICHE 1 OF 1

NOV 1976

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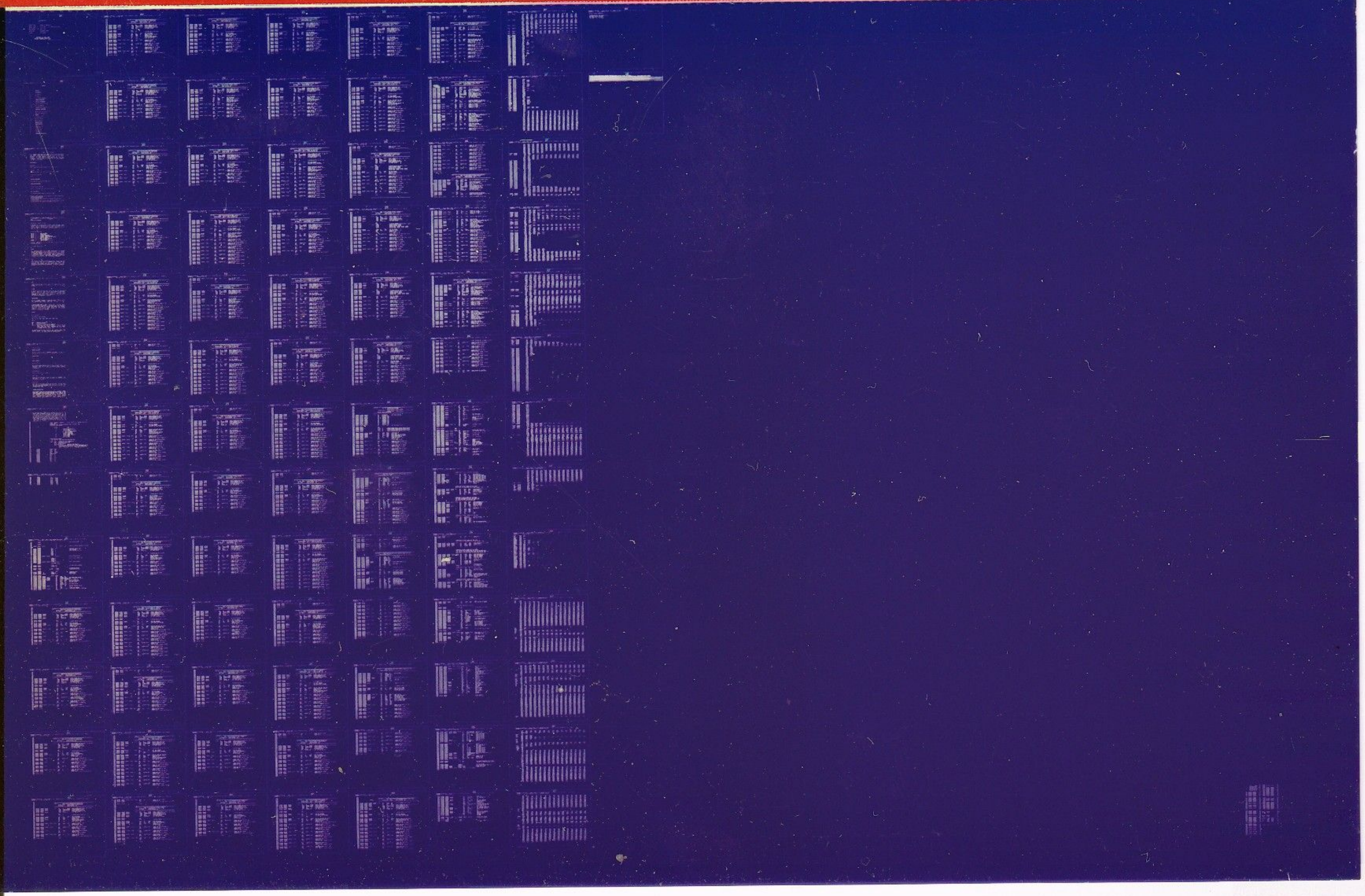

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DBKEA-B-D

PRODUCT NAME: KE11F (PDP-11 FIS) INSTRUCTION TESTS

DATE CREATED: APRIL 1973

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: KEN CHAPMAN



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29                          .subtitle Table of Contents
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.indent -10 1. Abstract

This program tests the KE11F (PDP-11 Floating Instruction Set (FADD, FSUB, FMUL, and FDIV)) option with fixed number patterns, using each register at least once as the stack pointer. It also checks stack overflow and that the floating instructions can be interupted (by the console teletype). The program should be run for at least 2 passes with all switches down.

2. REQUIREMENTS

2.1 Equipment

PDP-11 (KD11A) standard computer with KE11F option

2.2 Storage

Program Storage - the routines use memory 0 - 17500

2.3 Preliminary programs

None

3. LOADING PROCEDURE

Use standard procedure for ABS tapes.

4. STARTING PROCEDURE

4.1 Control switch settings

See 5.1.1 (all down for worst case testing)

4.2 Starting address

The program should always be started at 200.

4.3 Program and/or operator action .blank 1 1) Load program into memory using ABS loader.
2) Load address 200.
3) Set switches (see sec 5.1.1) All down for worst case
4) Press start.
5; The interupt test section will type three random length lines of @'s on the console teletype every pass.

Description

6) The program will loop and bell will ring once every pass.
7) A minimum of two passes should always be run.
141 .blank 2

5. OPERATING PROCEDURE

5.1 Operational switch settings

At SA 200, all switches down is worst case testing. Each subtest will be looped upon until completion of 256 passes of that subtest. The bell will ring upon completion of a pass of the entire program. Alternate pass will run with the T-bit set.

5.1.1 Switch settings are:

```
SW<15> = 1 ..... HALT ON ERROR
SW<14> = 1 ..... SCOPE LOOP
SW<13> = 1 ..... INHIBIT PRINTOUT
SW<12> = 1 ..... INHIBIT TRACE TRAPPING
SW<11> = 1 ..... INHIBIT ITERATIONS OF SUBTEST
SW<10> = 1 ..... BELL ON ERROR
         0 ..... BELL ON PASS COMPLETE
SW<09> = 1 ..... LOOP ON ERROR
SW<08> = 1 ..... LOOP ON TEST IN SW<7:0>
```

Caution: SW<8:0> are also used for ROM word match with KM11 maintenance card.

5.2 Subroutine Abstracts

5.2.1 SCOPE

This subroutine call (via a TRAP instruction) is placed between each subtest in the instruction section. It records the starting address of each subtest as it is being entered in location "LADS". If a scope loop is requested, the current subtest will be looped upon. SW<11> on a 1 inhibits iteration of subtests. The contents of "LADS" may be used to determine the last subtest successfully completed.

5.2.2 HLT

This routine (called by an EMT instruction) prints out an error message (See 6.1.) If SW<9> is on a 1 and a HLT is executed, the subtest will be looped upon until 256 consecutive good passes are completed. To inhibit typeouts, put SW<13> on a 1. To ring the bell on an error, put SW<10> on a 1.

5.2.3 NOP

A NOP is placed just before each FIS instruction. This allows the operator to patch in a HALT for debugging purposes.

5.2.4 TRTRAP

If SW<12> is on a 0, the T-bit will be set on alternate passes. When the T-bit is set, the processor traps after each instruction. The first instruction executed upon trapping is an "RTT" which returns to the interrupted sequence of instructions. This sequence is continued until the end of the program is reached.

5.2.5 TRAPCATCHER

A ".+2" - "HALT" sequence is repeated from 0 - 776 to catch any unexpected traps. Thus any unexpected traps or interupts will HALT at the vector + 2.

5.2.6 FLOATING ERROR TRAP (to 244) .blank 1 If a floating point error (overflow, underflow, or divide by zero) was expected, the vector will point to a unique ISR within the subtest where the error occured which checks the data on the stack(s). If an error was not anticipated, an erroneous trap will be detected in TRAPER.

6. ERRORS

6.1 Error printout

The format is as follows:

ADR PS SP ANS1 ANS2 ANS3 ANS4 ANS5 ANS6

where:

ADR = Address of error HLT
PS = Processor Status
SP = Contents of Stack Pointer Register
ANS1-6 = Error data read from the STACK(s). From 0 to 6 of these may be typed depending on the number following the HLT; e.g., HLT+3 would type ANS1 thru ANS3, HLT (by itself) woul

To find the failing test, look at the listing above the address typed. In most cases the comment beside the HLT tells what was being checked and what was expected.

6.2 Error recovery

Restart at 200 .blank 2

6.3 Error counter

An error count is kept in "ERRORS" (LOC 1002). It can only be cleared from the console or by reloading the program.

7. RESTRICTIONS

None

8. MISCELLANEOUS

8.1 Execution time

Due to the random characteristic of the interupt tests, the execution time can be half a minute or more. However, normally a bell will ring within 15 seconds with all switches down.

8.2 Stack Pointer

Stack is initally set to 500

8.3 Pass count

A 32 bit (2 words) pass count is kept in "PASSES" (LOC 1004,1006). It can only be cleared from the console or by reloading the program.

8.4 Power Fail

Each test can be power failed with no errors. To use, start the test as usual and power down then up at any time. The program should type "POWER" and continue to run from where the power fail inter

9. PROGRAM DESCRIPTION

This program tests all the instructions of the KE11F (FADD, FSUB, FMUL, and FDIV) ALL REGISTERS ARE CHECK TO SEE IF THEY FUNCTION PROPERLY AS THE STACK POINTER. THE PROGRAM HAS MANY SUBTESTS (THE CODE BETWEEN 2 SCOPE statements) which are run 256 times before continuing to the next. dbkea-b ke11f (pdp-11 fis) instruction tests. macy11 27(732) 20-sep-76 13:41 page 9 SW(11) on a 1 causes each subtest to

Description

be run only once. SW(9) on a 1 enables loop on error. The address ICNT (LOC 1000) contains the iteration count in the left byte and the test number in the right byte. All the subtests should be run sequentially by starting at 200 not by starting at the beginning of the subtest. To loop on a particular subtest, put the test number (see listing) in the right byte of the switch register and SW(8) on a 1. This test will be looped upon until SW(8) is put on a 0 or the right byte is changed. If the test is non-existant, the program will be run as usual.

```
                                .TITLE  MAINDEC-11-DBKEA-B      KE11F (PDP-11 FIS) INSTRUCTION TESTS.
                                .ENABL  ABS
                                ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS
                                ;PROGRAM BY KEN CHAPMAN

                                ;       SWITCH                  USE
                                ;       ------          --------------------
                                ;          8            LOOP ON TEST IN SW(7:0)
                                ;          9            LOOP ON ERROR
                                ;         10            0 - BELL ON PASS COMPLETE
                                ;                       1 - BELL ON ERROR
                                ;         11            INHIBIT ITERATIONS
                                ;         12            INHIBIT TRACE TRAP
                                ;         13            INHIBIT ERROR TYPEOUTS
                                ;         14            LOOP ON TEST
                                ;         15            HALT ON ERROR

                                ;ERROR MESSAGE FORMAT:
                                ;  ADR  PSW  SP  ANS1 ANS2 ANS3 ANS4 ANS5 ANS6
                                ;
                                ;WHERE  ADR =    ADDRESS OF "HLT" INSTRUCTION + 2
                                ;       PSW =    PROCESSOR STATUS WORD
                                ;       SP =     STACK POINTER
                                ;       ANS1 THRU ANS6 =        DATA OFF THE STACK(S)
                                ;       NOTE:    ANS1 THRU ANS6 ARE NOT ALWAYS TYPED, DEPENDING ON THE
                                ;                NUMBER ADDED TO THE "HLT".  "HLT" ALONE TYPES NONE,
                                ;                "HLT+1" TYPES ANS1, "HLT+2" TYPES ANS1 AND ANS2, ETC.

000400                          SCOPE=  TRAP
104000                          HLT=    EMT
000004                          TYPE=   IOT
177776                          PS=     177776
177570                          SWR=    177570
177570                          DISPLAY=SWR
000007                          BELL=   7
000000                          R0=     %0
000001                          R1=     %1
000002                          R2=     %2
000003                          R3=     %3
000004                          R4=     %4
000005                          R5=     %5
000005                          TTY=    %5
000006                          SP=     %6
```

# I01



```
    387          000007                  PC=     %7
    388          100000                  SW15=   100000
    389          040000                  SW14=    40000
    390          020000                  SW13=    20000
    391          010000                  SW12=    10000
    392          004000                  SW11=     4000
    393          002000                  SW10=     2000
    394          001000                  SW09=     1000
    395          000400                  SW08=      400
```

```
                        000000                  .=      0                       ;TRAP CATCHER FROM 0 - 776
                        000200                  .=      200
000200  000167  000604                          JMP     BEGIN                   ;JUMP TO STARTING ADDRESS OF PROGRAM
                        000600                  .=      600
000600  000000                          $PSW:   0                               ;PROCESSOR STATUS WORD
000602  000000                          $SP:    0                               ;STACK POINTER
000604  000000                          ANS1:   0                               ;FIRST ANSWER (SEE CODE)
000606  000000                          ANS2:   0
000610  000000                          ANS3:   0
000612  000000                          ANS4:   0
000614  000000                          ANS5:   0
000616  000000                          ANS6:   0
000620  000000  000000  000000          .       0,0,0,0                         ;NON-%6 STACK BUFFER
000626  000000
000630  000000                          STACK0: 0                               ;NON-%6 STACK NORMAL LIMIT
000632  000000                          STACK2: 0                               ;
000634  000000                          STACK4: 0                               ;
000636  000000                          STACK6: 0                               ;
000640  000000  000000  000000          STACK8: 0,0,0,0                         ;NON-%6 STACK BUFFER
000646  000000
                        000631          STACK1 = STACK0+1
000650  000244                          FISVEC: 244                             ;FIS TRAP VECTOR ADDRESS
000652  000246                          FISLVL: 246
177564                                  TPS:    177564                          ;TELEPRINTER STATUS
177566                                  TPB:    177566                          ;TELEPRINTER BUFFER
                        001000                  .=      1000
001000  000000                          ICNT:   0                               ;ITERATION COUNT - LH   TEST NO. - RH
001002  000000                          ERRORS: 0                               ;ERROR COUNT
001004  000000  000000                  PASSES: 0,0                             ;PASS COUNTER
001010  000005                          BEGIN:  RESET
001012  012706  000500                          MOV     #500,   SP
001016  012737  015772  000014                  MOV     #YESRT, @#14            ;SET TRACE TRAP VECTOR
001024  012777  017124  016250                  MOV     #PDOWN$,@PDVEC$         ;SET UP POWER FAIL VECTOR
001032  012777  000340  016244                  MOV     #340,   @PDVEC$+2
001040  012737  017322  000020                  MOV     #.IOT,  @#20            ;SET UP VECTOR 20
001046  012700  000030                          MOV     #30,    R0              ;SET R0 TO VECTOR 30
001052  012720  016600                          MOV     #HLT$,  (0)+            ;SET EMT VECTOR
001056  012720  000340                          MOV     #340,   (0)+
001062  012720  015774                          MOV     #SCOPE$,(0)+            ;SET TRAP VECTOR
001066  012710  000340                          MOV     #340,   (0)
001072  012737  000006  000004  1$:     MOV     #6,     @#4             ;RESTORE TIME-OUT VECTOR
001100  005067  177674                          CLR     ICNT
001104  005067  015016                          CLR     LAD$                    ;CLEAR LOOP ADDRESS
001110  012767  000377  015012                  MOV     #377,   TIMES   ;INITIALIZE NUMBER OF ITERATIONS
001116  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 1:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       000000,000000 + 000000,000000 = 000000,000000
                                ;       PS = 004,       STACK POINTER = R0
                                ;*************************************************************************

001120  004567  015164          TST1:   JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
001124  000000  000000                  .WORD   000000,000000   ;SECOND OPERAND ON TOP
001130  000000  000000                  .WORD   000000,000000   ;FIRST OPERAND ON BOTTOM
001134  000000                          .WORD   000             ;PROCESSOR PRIORITY LEVEL
001136  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
001142  012700  000630                  MOV     #STACK0,R0      ;SET UP STACK POINTER

001146  000240                          NOP
001150  075000                          FADD+   R0              ;FLOATING ADD ON THE R0 STACK

001152  004767  015164                  JSR     PC,     POPR    ;POP THE ANSWER
001156  010067  177420                  MOV     R0,     $SP     ;SAVE "STACK POINTER"
001162  022767  000004  177410          CMP     #004,   $PSW    ;CHECK PS (EXCEPT T BIT)
001170  001401                          BEQ     .+4             ;BRANCH IF OK
001172  104000                          HLT                     ;PS NOT EQUAL TO 004

001174  022767  000634  177400          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R0)
001202  001401                          BEQ     .+4             ;BRANCH IF OK
001204  104000                          HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK4

001206  005767  177372                  TST     ANS1            ;CHECK FIRST HALF OF ANSWER
001212  001401                          BEQ     .+4             ;BRANCH IF OK
001214  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 000000

001216  005767  177364                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
001222  001401                          BEQ     .+4             ;BRANCH IF OK
001224  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

001226  122767  000001  177544  END1:   CMPB    #1,     ICNT    ;CHECK THE TEST NUMBER
001234  001401                          BEQ     .+4             ;BRANCH IF OK
001236  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

001240  104400                          SCOPE
```

```
                                ;*****************************************************************
                                ;TEST 2:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       040200,000000 + 040200,000000 = 040400,000000
                                ;       PS = 040,       STACK POINTER = R1
                                ;*****************************************************************

001242  004567  015042        TST2:   JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
001246  040200  000000                .WORD   040200,000000   ;SECOND OPERAND ON TOP
001252  040200  000000                .WORD   040200,000000   ;FIRST OPERAND ON BOTTOM
001256  000040                        .WORD   040             ;PROCESSOR PRIORITY LEVEL
001260  016574  000340                .WORD   TRAPER,340      ;FIS TRAP VECTOR
001264  012701  000630                MOV     #STACK0,R1      ;SET UP STACK POINTER

001270  000240                        NOP
001272  075001                        FADD+   R1              ;FLOATING ADD ON THE R1 STACK

001274  004767  015042                JSR     PC,     POPR    ;POP THE ANSWER
001300  010167  177276                MOV     R1,     $SP     ;SAVE "STACK POINTER"
001304  022767  000040  177266        CMP     #040,   $PSW    ;CHECK PS (EXCEPT T BIT)
001312  001401                        BEQ     .+4             ;BRANCH IF OK
001314  104000                        HLT                     ;PS NOT EQUAL TO 040

001316  022767  000634  177256        CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R1)
001324  001401                        BEQ     .+4             ;BRANCH IF OK
001326  104000                        HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK4

001330  022767  040400  177246        CMP     #040400,ANS1    ;CHECK FIRST HALF OF ANSWER
001336  001401                        BEQ     .+4             ;BRANCH IF OK
001340  104002                        HLT+2                   ;ANS1 NOT EQUAL TO 040400

001342  005767  177240                TST     ANS2            ;CHECK SECOND HALF OF ANSWER
001346  001401                        BEQ     .+4             ;BRANCH IF OK
001350  104002                        HLT+2                   ;ANS2 NOT EQUAL TO 000000

001352  122767  000002  177420  END2: CMPB    #2,     ICNT    ;CHECK THE TEST NUMBER
001360  001401                        BEQ     .+4             ;BRANCH IF OK
001362  104000                        HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

001364  104400                        SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 3:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       077777,177777 + 177777,177777 = 000000,000000
                                ;       PS = 104,       STACK POINTER = R2
                                ;*************************************************************************

001366  004567  014716          TST3:   JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R2 STACK, SET PRIORITY
001372  177777  177777                  .WORD   177777,177777   ;SECOND OPERAND ON TOP
001376  077777  177777                  .WORD   077777,177777   ;FIRST OPERAND ON BOTTOM
001402  000100                          .WORD   100             ;PROCESSOR PRIORITY LEVEL
001404  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
001410  012702  000630                  MOV     #STACK0,R2      ;SET UP STACK POINTER

001414  000240                          NOP
001416  075002                          FADD+   R2              ;FLOATING ADD ON THE R2 STACK

001420  004767  014716                  JSR     PC,     POPR    ;POP THE ANSWER
001424  010267  177152                  MOV     R2,     $SP     ;SAVE "STACK POINTER"
001430  022767  000104  177142          CMP     #104,   $PSW    ;CHECK PS (EXCEPT T BIT)
001436  001401                          BEQ     .+4             ;BRANCH IF OK
001440  104000                          HLT                     ;PS NOT EQUAL TO 104

001442  022767  000634  177132          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R2)
001450  001401                          BEQ     .+4             ;BRANCH IF OK
001452  104000                          HLT                     ;STACK POINTER (R2) NOT EQUAL TO #STACK4

001454  005767  177124                  TST     ANS1            ;CHECK FIRST HALF OF ANSWER
001460  001401                          BEQ     .+4             ;BRANCH IF OK
001462  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 000000

001464  005767  177116                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
001470  001401                          BEQ     .+4             ;BRANCH IF OK
001472  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

001474  122767  000003  177276  END3:   CMPB    #3,     ICNT    ;CHECK THE TEST NUMBER
001502  001401                          BEQ     .+4             ;BRANCH IF OK
001504  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

001506  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 4:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       052525,052525 + 152525,052524 = 044600,000000
                                ;       PS = 200,       STACK POINTER = SP
                                ;*************************************************************************

001510  004567  014416          TST4:   JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
001514  152525  052524                  .WORD   152525,052524   ;SECOND OPERAND ON TOP
001520  052525  052525                  .WORD   052525,052525   ;FIRST OPERAND ON BOTTOM
001524  000217                          .WORD   217             ;PROCESSOR PRIORITY LEVEL
001526  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR

001532  000240                          NOP
001534  075006                          FADD+   SP              ;FLOATING ADD ON THE STACK

001536  004767  014430                  JSR     PC,     POPS    ;POP THE ANSWER
001542  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
001546  001404                          BEQ     TSA4            ;BRANCH IF OK
001550  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
001554  104000                          HLT                     ;STACK POINTER FOULED UP
001556  000416                          BR      END4            ;SKIP REST OF TEST

001560  022767  000200  177012  TSA4:   CMP     #200,   $PSW    ;CHECK PS (EXCEPT T BIT)
001566  001401                          BEQ     .+4             ;BRANCH IF OK
001570  104000                          HLT                     ;PS NOT EQUAL TO 200

001572  022767  044600  177004          CMP     #044600,ANS1    ;CHECK FIRST HALF OF ANSWER
001600  001401                          BEQ     .+4             ;BRANCH IF OK
001602  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 044600

001604  005767  176776                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
001610  001401                          BEQ     .+4             ;BRANCH IF OK
001612  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

001614  122767  000004  177156  END4:   CMPB    #4,     ICNT    ;CHECK THE TEST NUMBER
001622  001401                          BEQ     .+4             ;BRANCH IF OK
001624  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

001626  104400                          SCOPE
```

```
                                ;*****************************************************************
                                ;TEST 5:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       125200,000000 + 025177,177777 = 117200,000000
                                ;       PS = 310,       STACK POINTER = SP
                                ;*****************************************************************

001630  004567  014276          TST5:   JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
001634  025177  177777                  .WORD   025177,177777   ;SECOND OPERAND ON TOP
001640  125200  000000                  .WORD   125200,000000   ;FIRST OPERAND ON BOTTOM
001644  000307                          .WORD   307             ;PROCESSOR PRIORITY LEVEL
001646  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR

001652  000240                          NOP
001654  075006                          FADD+   SP              ;FLOATING ADD ON THE STACK

001656  004767  014310                  JSR     PC,     POPS    ;POP THE ANSWER
001662  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
001666  001404                          BEQ     TSA5            ;BRANCH IF OK
001670  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
001674  104000                          HLT                     ;STACK POINTER FOULED UP
001676  000416                          BR      ENDS            ;SKIP REST OF TEST

001700  022767  000310  176672  TSA5:   CMP     #310,   $PSW    ;CHECK PS (EXCEPT T BIT)
001706  001401                          BEQ     .+4             ;BRANCH IF OK
001710  104000                          HLT                     ;PS NOT EQUAL TO 310

001712  022767  117200  176664          CMP     #117200,ANS1    ;CHECK FIRST HALF OF ANSWER
001720  001401                          BEQ     .+4             ;BRANCH IF OK
001722  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 117200

001724  005767  176656                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
001730  001401                          BEQ     .+4             ;BRANCH IF OK
001732  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

001734  122767  000005  177036  ENDS:   CMPB    #5,     ICNT    ;CHECK THE TEST NUMBER
001742  001401                          BEQ     .+4             ;BRANCH IF OK
001744  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

001746  104400                          SCOPE
```

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                                ;*************************************************************************
                                ;TEST 6:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       135753,024642 + 100125,052525 = 135753,024642
                                ;       PS = 350,       STACK POINTER = R5
                                ;*************************************************************************

001750  004567  014334          TST6:   JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R5 STACK, SET PRIORITY
001754  100125  052525                  .WORD   100125,052525   ;SECOND OPERAND ON TOP
001760  135753  024642                  .WORD   135753,024642   ;FIRST OPERAND ON BOTTOM
001764  000347                          .WORD   347             ;PROCESSOR PRIORITY LEVEL
001766  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
001772  012705  000630                  MOV     #STACK0,R5      ;SET UP STACK POINTER

001776  000240                          NOP
002000  075005                          FADD+   R5              ;FLOATING ADD ON THE R5 STACK

002002  004767  014334                  JSR     PC,     POPR    ;POP THE ANSWER
002006  010567  176570                  MOV     R5,     $SP     ;SAVE "STACK POINTER"
002012  022767  000350  176560          CMP     #350,   $PSW    ;CHECK PS (EXCEPT T BIT)
002020  001401                          BEQ     .+4             ;BRANCH IF OK
002022  104000                          HLT                     ;PS NOT EQUAL TO 350

002024  022767  000634  176550          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R5)
002032  001401                          BEQ     .+4             ;BRANCH IF OK
002034  104000                          HLT                     ;STACK POINTER (R5) NOT EQUAL TO #STACK4

002036  022767  135753  176540          CMP     #135753,ANS1    ;CHECK FIRST HALF OF ANSWER
002044  001401                          BEQ     .+4             ;BRANCH IF OK
002046  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 135753

002050  022767  024642  176530          CMP     #024642,ANS2    ;CHECK SECOND HALF OF ANSWER
002056  001401                          BEQ     .+4             ;BRANCH IF OK
002060  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 024642

002062  122767  000006  176710  END6:   CMPB    #6,     ICNT    ;CHECK THE TEST NUMBER
002070  001401                          BEQ     .+4             ;BRANCH IF OK
002072  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

002074  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 7:        FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       000052,125252 + 001357,024642 = 001357,024642
                                ;       PS = 240,       STACK POINTER = R1
                                ;*************************************************************************

002076  004567  014206          TST7:   JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
002102  001357  024642                  .WORD   001357,024642   ;SECOND OPERAND ON TOP
002106  000052  125252                  .WORD   000052,125252   ;FIRST OPERAND ON BOTTOM
002112  000257                          .WORD   257             ;PROCESSOR PRIORITY LEVEL
002114  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
002120  012701  000630                  MOV     #STACK0,R1      ;SET UP STACK POINTER

002124  000240                          NOP
002126  075001                          FADD+   R1              ;FLOATING ADD ON THE R1 STACK

002130  004767  014206                  JSR     PC,     POPR    ;POP THE ANSWER
002134  010167  176442                  MOV     R1,     $SP     ;SAVE "STACK POINTER"
002140  022767  000240  176432          CMP     #240,   $PSW    ;CHECK PS (EXCEPT T BIT)
002146  001401                          BEQ     .+4             ;BRANCH IF OK
002150  104000                          HLT                     ;PS NOT EQUAL TO 240

002152  022767  000634  176422          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R1)
002160  001401                          BEQ     .+4             ;BRANCH IF OK
002162  104000                          HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK4

002164  022767  001357  176412          CMP     #001357,ANS1    ;CHECK FIRST HALF OF ANSWER
002172  001401                          BEQ     .+4             ;BRANCH IF OK
002174  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 001357

002176  022767  024642  176402          CMP     #024642,ANS2    ;CHECK SECOND HALF OF ANSWER
002204  001401                          BEQ     .+4             ;BRANCH IF OK
002206  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 024642

002210  122767  000007  176562  END7:   CMPB    #7,     ICNT    ;CHECK THE TEST NUMBER
002216  001401                          BEQ     .+4             ;BRANCH IF OK
002220  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

002222  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 10:       FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       100400,000000 + 000200,000000 = 100200,000000
                                ;       PS = 150,       STACK POINTER = R5
                                ;*************************************************************************

002224  004567  014060          TST10:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R5 STACK, SET PRIORITY
002230  000200  000000                  .WORD   000200,000000   ;SECOND OPERAND ON TOP
002234  100400  000000                  .WORD   100400,000000   ;FIRST OPERAND ON BOTTOM
002240  000140                          .WORD   140             ;PROCESSOR PRIORITY LEVEL
002242  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
002246  012705  000630                  MOV     #STACK0,R5      ;SET UP STACK POINTER

002252  000240                          NOP
002254  075005                          FADD+   R5              ;FLOATING ADD ON THE R5 STACK

002256  004767  014060                  JSR     PC,     POPR    ;POP THE ANSWER
002262  010567  176314                  MOV     R5,     $SP     ;SAVE "STACK POINTER"
002266  022767  000150  176304          CMP     #150,   $PSW    ;CHECK PS (EXCEPT T BIT)
002274  001401                          BEQ     .+4             ;BRANCH IF OK
002276  104000                          HLT                     ;PS NOT EQUAL TO 150

002300  022767  000634  176274          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R5)
002306  001401                          BEQ     .+4             ;BRANCH IF OK
002310  104000                          HLT                     ;STACK POINTER (R5) NOT EQUAL TO #STACK4

002312  022767  100200  176264          CMP     #100200,ANS1    ;CHECK FIRST HALF OF ANSWER
002320  001401                          BEQ     .+4             ;BRANCH IF OK
002322  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 100200

002324  005767  176256                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
002330  001401                          BEQ     .+4             ;BRANCH IF OK
002332  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

002334  122767  000010  176436  END10:  CMPB    #10,    ICNT    ;CHECK THE TEST NUMBER
002342  001401                          BEQ     .+4             ;BRANCH IF OK
002344  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

002346  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 11:       FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       100200,000000 + 000377,177777 ==> UNDERFLOW
                                ;       PS(ON STACK) = 152,     STACK POINTER = R3
                                ;*************************************************************************

002350  004567  013734          TST11:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R3 STACK, SET PRIORITY
002354  000377  177777                  .WORD   000377,177777   ;SECOND OPERAND ON TOP
002360  100200  000000                  .WORD   100200,000000   ;FIRST OPERAND ON BOTTOM
002364  000157                          .WORD   157             ;PROCESSOR PRIORITY LEVEL
002366  002416  000000                  .WORD   ISR11,  000     ;FIS TRAP VECTOR
002372  012703  000630                  MOV     #STACK0,R3      ;SET UP R3 AS STACK POINTER

002376  000240                          NOP
002400  075003                          FADD+   R3              ;FLOATING ADD ON THE R3 STACK

002402  004767  013734          RTA11:  JSR     %7,     POPR    ;POP THE "ANSWER"
002406  010367  176170                  MOV     R3,     $SP     ;SAVE STACK POINTER (R3)
002412  104002                          HLT+2                   ;FIS TRAP DIDN'T OCCURE!
002414  000452                          BR      END11

002416  004767  013752          ISR11:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
002422  010367  176154                  MOV     R3,     $SP     ;SAVE STACK POINTER (R3)
002426  005767  176146                  TST     $PSW            ;CHECK PS AFTER FIS TRAP
002432  001401                          BEQ     .+4             ;BRANCH IF OK
002434  104000                          HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 000

002436  022767  000630  176136          CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R3)
002444  001401                          BEQ     .+4             ;BRANCH IF OK
002446  104000                          HLT                     ;STACK POINTER (R3) NOT EQUAL TO #STACK0

002450  022767  002402  176126          CMP     #RTA11, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
002456  001401                          BEQ     .+4             ;BRANCH IF OK
002460  104001                          HLT+1                   ;FIS TRAP AT WRONG ADDRESS

002462  022767  000152  176116          CMP     #152,   ANS2    ;CHECK PS BEFORE FIS TRAP
002470  001401                          BEQ     .+4             ;BRANCH IF OK
002472  104002                          HLT+2                   ;PS AT FIS TRAP TIME NOT 152

002474  022767  000377  176106          CMP     #000377,ANS3    ;CHECK DATA FROM THE STACK
002502  001401                          BEQ     .+4             ;BRANCH IF OK
002504  104004                          HLT+4                   ;DATA ON STACK (000377) CHANGED

002506  022767  177777  176076          CMP     #177777,ANS4    ;CHECK DATA FROM STACK
002514  001401                          BEQ     .+4             ;BRANCH IF OK
002516  104004                          HLT+4                   ;DATA ON STACK (177777) CHANGED

002520  022767  100200  176066          CMP     #100200,ANS5    ;CHECK DATA FROM STACK
002526  001401                          BEQ     .+4             ;BRANCH IF OK
002530  104006                          HLT+6                   ;DATA ON STACK (100200) CHANGED

002532  005767  176060                  TST     ANS6            ;CHECK DATA FROM STACK
002536  001401                          BEQ     .+4             ;BRANCH IF OK
002540  104006                          HLT+6                   ;DATA ON STACK (000000) CHANGED
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832  002542  122767  000011  176230  END11:  CMPB    #11,    ICNT    ;CHECK THE TEST NUMBER
833  002550  001401                          BEQ     .+4             ;BRANCH IF OK
834  002552  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
835
836  002554  104400                          SCOPE
837
838
839                                  ;*************************************************************************
840                                  ;TEST 12:       FADD (KE11F FLOATING ADD INSTRUCTION)
84'                                  ;       000425,052525 + 100252,125252 = 000200,000000
842                                  ;       PS = 200,       STACK POINTER = R4
843                                  ;*************************************************************************
844
845  002556  004567  013526          TST12:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
846  002562  100252  125252                  .WORD   100252,125252   ;SECOND OPERAND ON TOP
847  002566  000425  052525                  .WORD   000425,052525   ;FIRST OPERAND ON BOTTOM
848  002572  000217                          .WORD   217             ;PROCESSOR PRIORITY LEVEL
849  002574  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
850  002600  012704  000630                  MOV     #STACK0,R4      ;SET UP STACK POINTER
851
852  002604  000240                          NOP
853  002606  075004                          FADD+   R4              ;FLOATING ADD ON THE R4 STACK
854
855  002610  004767  013526                  JSR     PC,     POPR    ;POP THE ANSWER
856  002614  010467  175762                  MOV     R4,     $SP     ;SAVE "STACK POINTER"
857  002620  022767  000200  175752          CMP     #200,   $PSW    ;CHECK PS (EXCEPT T BIT)
858  002626  001401                          BEQ     .+4             ;BRANCH IF OK
859  002630  104000                          HLT                     ;PS NOT EQUAL TO 200
860
861  002632  022767  000634  175742          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R4)
862  002640  001401                          BEQ     .+4             ;BRANCH IF OK
863  002642  104000                          HLT                     ;STACK POINTER (R4) NOT EQUAL TO #STACK4
864
865  002644  022767  000200  175732          CMP     #000200,ANS1    ;CHECK FIRST HALF OF ANSWER
866  002652  001401                          BEQ     .+4             ;BRANCH IF OK
867  002654  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 000200
868
869  002656  005767  175724                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
870  002662  001401                          BEQ     .+4             ;BRANCH IF OK
871  002664  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000
872
873  002666  122767  000012  176104  END12:  CMPB    #12,    ICNT    ;CHECK THE TEST NUMBER
874  002674  001401                          BEQ     .+4             ;BRANCH IF OK
875  002676  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
876
877  002700  104400                          SCOPE
878
```

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879
880                                     ;*************************************************************************
881                                     ;TEST 13:       FADD (KE11F FLOATING ADD INSTRUCTION)
882                                     ;       000200,000000 + 100377,177777 ==> UNDERFLOW
883                                     ;       PS(ON STACK) = 252,     STACK POINTER = SP
884                                     ;*************************************************************************
885
886  002702  004567  013224        TST13:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
887  002706  100377  177777                .WORD   100377,177777   ;SECOND OPERAND ON TOP
888  002712  000200  000000                .WORD   000200,000000   ;FIRST OPERAND ON BOTTOM
889  002716  000257                        .WORD   257             ;PROCESSOR PRIORITY LEVEL
890  002720  002744  000340                .WORD   ISR13,  340     ;FIS TRAP VECTOR
891
892  002724  000240                        NOP
893  002726  075006                        FADD+   SP              ;FLOATING ADD ON THE STACK
894
895  002730  004767  013236        RTA13:  JSR     %7,     POPS    ;POP THE "ANSWER"
896  002734  104002                        HLT+2                   ;FIS TRAP DIDN'T OCCURE!
897  002736  012706  000500                MOV     #500,   SP      ;RESTORE THE STACK POINTER
898  002742  000453                        BR      END13
899
900  002744  004767  013256        ISR13:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
901  002750  022706  000500                CMP     #500,   SP      ;CHECK THE STACK POINTER
902  002754  001404                        BEQ     ISA13           ;BRANCH IF OK
903  002756  012706  000500                MOV     #500,   SP      ;RESTORE THE STACK POINTER
904  002762  104000                        HLT                     ;STACK POINTER FOULED UP
905  002764  000442                        BR      END13           ;SKIP REST OF TEST
906
907  002766  022767  000340  175604 ISA13:  CMP     #340,   $PSW    ;CHECK PS AFTER FIS TRAP
908  002774  001401                        BEQ     .+4             ;BRANCH IF OK
909  002776  104000                        HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 340
910
911  003000  022767  002730  175576        CMP     #RTA13, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
912  003006  001401                        BEQ     .+4             ;BRANCH IF OK
913  003010  104001                        HLT+1                   ;FIS TRAP AT WRONG ADDRESS
914
915  003012  022767  000252  175566        CMP     #252,   ANS2    ;CHECK PS BEFORE FIS TRAP
916  003020  001401                        BEQ     .+4             ;BRANCH IF OK
917  003022  104002                        HLT+2                   ;PS AT FIS TRAP TIME NOT 252
918
919  003024  022767  100377  175556        CMP     #100377,ANS3    ;CHECK DATA FROM THE STACK
920  003032  001401                        BEQ     .+4             ;BRANCH IF OK
921  003034  104004                        HLT+4                   ;DATA ON STACK (100377) CHANGED
922
923  003036  022767  177777  175546        CMP     #177777,ANS4    ;CHECK DATA FROM STACK
924  003044  001401                        BEQ     .+4             ;BRANCH IF OK
925  003046  104004                        HLT+4                   ;DATA ON STACK (177777) CHANGED
926
927  003050  022767  000200  175536        CMP     #000200,ANS5    ;CHECK DATA FROM STACK
928  003056  001401                        BEQ     .+4             ;BRANCH IF OK
929  003060  104006                        HLT+6                   ;DATA ON STACK (000200) CHANGED
930
931  003062  005767  175530                TST     ANS6            ;CHECK DATA FROM STACK
932  003066  001401                        BEQ     .+4             ;BRANCH IF OK
933  003070  104006                        HLT+6                   ;DATA ON STACK (000000) CHANGED
934
```

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                                                ;*****************************************************************
                                                ;TEST 14:       FADD (KE11F FLOATING ADD INSTRUCTION)
                                                ;       100425,052525 + 000252,125252 = 100200,000000
                                                ;       PS = 310,       STACK POINTER = SP
                                                ;*****************************************************************

003106  004567  013020          TST14:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
003112  000252  125252                  .WORD   000252,125252   ;SECOND OPERAND ON TOP
003116  100425  052525                  .WORD   100425,052525   ;FIRST OPERAND ON BOTTOM
003122  000307                          .WORD   307             ;PROCESSOR PRIORITY LEVEL
003124  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR

003130  000240                          NOP
003132  075006                          FADD+   SP              ;FLOATING ADD ON THE STACK

003134  004767  013032                  JSR     PC,     POPS    ;POP THE ANSWER
003140  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
003144  001404                          BEQ     TSA14           ;BRANCH IF OK
003146  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
003152  104000                          HLT                     ;STACK POINTER FOULED UP
003154  000416                          BR      END14           ;SKIP REST OF TEST

003156  022767  000310  175414  TSA14:  CMP     #310,   $PSW    ;CHECK PS (EXCEPT T BIT)
003164  001401                          BEQ     .+4             ;BRANCH IF OK
003166  104000                          HLT                     ;PS NOT EQUAL TO 310

003170  022767  100200  175406          CMP     #100200,ANS1    ;CHECK FIRST HALF OF ANSWER
003176  001401                          BEQ     .+4             ;BRANCH IF OK
003200  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 100200

003202  005767  175400                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
003206  001401                          BEQ     .+4             ;BRANCH IF OK
003210  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000

003212  122767  000014  175560  END14:  CMPB    #14,    ICNT    ;CHECK THE TEST NUMBER
003220  001401                          BEQ     .+4             ;BRANCH IF OK
003222  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

003224  104400                          SCOPE
```

```
                                ;*************************************************************************
                                ;TEST 15:       FADD (KE11F FLOATING ADD INSTRUCTION)
                                ;       077652,125252 + 077452,125252 = 077777,177777
                                ;       PS = 240,       STACK POINTER = SP
                                ;*************************************************************************

003226  004567  012700          TST15:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
003232  077452  125252                  .WORD   077452,125252   ;SECOND OPERAND ON TOP
003236  077652  125252                  .WORD   077652,125252   ;FIRST OPERAND ON BOTTOM
003242  000257                          .WORD   257             ;PROCESSOR PRIORITY LEVEL
003244  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR

003250  000240                          NOP
003252  075006                          FADD+   SP              ;FLOATING ADD ON THE STACK

003254  004767  012712                  JSR     PC,     POPS    ;POP THE ANSWER
003260  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
003264  001404                          BEQ     TSA15           ;BRANCH IF OK
003266  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
003272  104000                          HLT                     ;STACK POINTER FOULED UP
003274  000417                          BR      END15           ;SKIP REST OF TEST

003276  022767  000240  175274  TSA15:  CMP     #240,   $PSW    ;CHECK PS (EXCEPT T BIT)
003304  001401                          BEQ     .+4             ;BRANCH IF OK
003306  104000                          HLT                     ;PS NOT EQUAL TO 240

003310  022767  077777  175266          CMP     #077777,ANS1    ;CHECK FIRST HALF OF ANSWER
003316  001401                          BEQ     .+4             ;BRANCH IF OK
003320  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 077777

003322  022767  177777  175256          CMP     #177777,ANS2    ;CHECK SECOND HALF OF ANSWER
003330  001401                          BEQ     .+4             ;BRANCH IF OK
003332  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 177777

003334  122767  000015  175436  END15:  CMPB    #15,    ICNT    ;CHECK THE TEST NUMBER
003342  001401                          BEQ     .+4             ;BRANCH IF OK
003344  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

003346  104400                          SCOPE
```

```
1023
1024                                    ;*************************************************************************
1025                                    ;TEST 16:       FADD (KE11F FLOATING ADD INSTRUCTION)
1026                                    ;       177452,125253 + 177652,125252 ==> OVERFLOW
1027                                    ;       PS(ON STACK) = 102,     STACK POINTER = R1
1028                                    ;*************************************************************************
1029
1030  003350  004567  012734           TST16:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
1031  003354  177652  125252                   .WORD   177652,125252   ;SECOND OPERAND ON TOP
1032  003360  177452  125253                   .WORD   177452,125253   ;FIRST OPERAND ON BOTTOM
1033  003364  000105                           .WORD   105             ;PROCESSOR PRIORITY LEVEL
1034  003366  003416  000252                   .WORD   ISR16,  252     ;FIS TRAP VECTOR
1035  003372  012701  000630                   MOV     #STACK0,R1      ;SET UP R1 AS STACK POINTER
1036
1037  003376  000240                           NOP
1038  003400  075001                           FADD+   R1              ;FLOATING ADD ON THE R1 STACK
1039
1040  003402  004767  012734           RTA16:  JSR     %7,     POPR    ;POP THE "ANSWER"
1041  003406  010167  175170                   MOV     R1,     $SP     ;SAVE STACK POINTER (R1)
1042  003412  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
1043  003414  000454                           BR      END16
1044
1045  003416  004767  012752           ISR16:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
1046  003422  010167  175154                   MOV     R1,     $SP     ;SAVE STACK POINTER (R1)
1047  003426  022767  000252  175144           CMP     #252,   $PSW    ;CHECK PS AFTER FIS TRAP
1048  003434  001401                           BEQ     .+4             ;BRANCH IF OK
1049  003436  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 252
1050
1051  003440  022767  000630  175134           CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R1)
1052  003446  001401                           BEQ     .+4             ;BRANCH IF OK
1053  003450  104000                           HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK0
1054
1055  003452  022767  003402  175124           CMP     #RTA16, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
1056  003460  001401                           BEQ     .+4             ;BRANCH IF OK
1057  003462  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
1058
1059  003464  022767  000102  175114           CMP     #102,   ANS2    ;CHECK PS BEFORE FIS TRAP
1060  003472  001401                           BEQ     .+4             ;BRANCH IF OK
1061  003474  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 102
1062
1063  003476  022767  177652  175104           CMP     #177652,ANS3    ;CHECK DATA FROM THE STACK
1064  003504  001401                           BEQ     .+4             ;BRANCH IF OK
1065  003506  104004                           HLT+4                   ;DATA ON STACK (177652) CHANGED
1066
1067  003510  022767  125252  175074           CMP     #125252,ANS4    ;CHECK DATA FROM STACK
1068  003516  001401                           BEQ     .+4             ;BRANCH IF OK
1069  003520  104004                           HLT+4                   ;DATA ON STACK (125252) CHANGED
1070
1071  003522  022767  177452  175064           CMP     #177452,ANS5    ;CHECK DATA FROM STACK
1072  003530  001401                           BEQ     .+4             ;BRANCH IF OK
1073  003532  104006                           HLT+6                   ;DATA ON STACK (177452) CHANGED
1074
1075  003534  022767  125253  175054           CMP     #125253,ANS6    ;CHECK DATA FROM STACK
1076  003542  001401                           BEQ     .+4             ;BRANCH IF OK
1077  003544  104006                           HLT+6                   ;DATA ON STACK (125253) CHANGED
1078
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1079  003546  122767  000016  175224  END16:  CMPB    #16,    ICNT    ;CHECK THE TEST NUMBER
1080  003554  001401                          BEQ     .+4             ;BRANCH IF OK
1081  003556  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1082
1083  003560  104400                          SCOPE
1084
1085
1086                                  ;*************************************************************************
1087                                  ;TEST 17:       FADD (KE11F FLOATING ADD INSTRUCTION)
1088                                  ;       177452,125252 + 177652,125252 = 177777,177777
1089                                  ;       PS = 350,       STACK POINTER = R4
1090                                  ;*************************************************************************
1091
1092  003562  004567  012522          TST17:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
1093  003566  177652  125252                  .WORD   177652,125252   ;SECOND OPERAND ON TOP
1094  003572  177452  125252                  .WORD   177452,125252   ;FIRST OPERAND ON BOTTOM
1095  003576  000357                          .WORD   357             ;PROCESSOR PRIORITY LEVEL
1096  003600  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
1097  003604  012704  000630                  MOV     #STACK0,R4      ;SET UP STACK POINTER
1098
1099  003610  000240                          NOP
1100  003612  075004                          FADD+   R4              ;FLOATING ADD ON THE R4 STACK
1101
1102  003614  004767  012522                  JSR     PC,     POPR    ;POP THE ANSWER
1103  003620  010467  174756                  MOV     R4,     $SP     ;SAVE "STACK POINTER"
1104  003624  022767  000350  174746          CMP     #350,   $PSW    ;CHECK PS (EXCEPT T BIT)
1105  003632  001401                          BEQ     .+4             ;BRANCH IF OK
1106  003634  104000                          HLT                     ;PS NOT EQUAL TO 350
1107
1108  003636  022767  000634  174736          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R4)
1109  003644  001401                          BEQ     .+4             ;BRANCH IF OK
1110  003646  104000                          HLT                     ;STACK POINTER (R4) NOT EQUAL TO #STACK4
1111
1112  003650  022767  177777  174726          CMP     #177777,ANS1    ;CHECK FIRST HALF OF ANSWER
1113  003656  001401                          BEQ     .+4             ;BRANCH IF OK
1114  003660  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 177777
1115
1116  003662  022767  177777  174716          CMP     #177777,ANS2    ;CHECK SECOND HALF OF ANSWER
1117  003670  001401                          BEQ     .+4             ;BRANCH IF OK
1118  003672  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 177777
1119
1120  003674  122767  000017  175076  END17:  CMPB    #17,    ICNT    ;CHECK THE TEST NUMBER
1121  003702  001401                          BEQ     .+4             ;BRANCH IF OK
1122  003704  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1123
1124  003706  104400                          SCOPE
1125
```

```
1126
1127                                    ;*************************************************************************
1128                                    ;TEST 20:       FADD (KE11F FLOATING ADD INSTRUCTION)
1129                                    ;       077652,125253 + 077452,125252 ==> OVERFLOW
1130                                    ;       PS(ON STACK) = 002,     STACK POINTER = SP
1131                                    ;*************************************************************************
1132
1133  003710  004567  012216           TST20:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1134  003714  077452  125252                   .WORD   077452,125252   ;SECOND OPERAND ON TOP
1135  003720  077652  125253                   .WORD   077652,125253   ;FIRST OPERAND ON BOTTOM
1136  003724  000003                           .WORD   003             ;PROCESSOR PRIORITY LEVEL
1137  003726  003752  000344                   .WORD   ISR20,  344     ;FIS TRAP VECTOR
1138
1139  003732  000240                           NOP
1140  003734  075006                           FADD+   SP              ;FLOATING ADD ON THE STACK
1141
1142  003736  004767  012230           RTA20:  JSR     %7,     POPS    ;POP THE "ANSWER"
1143  003742  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
1144  003744  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1145  003750  000454                           BR      END20
1146
1147  003752  004767  012250           ISR20:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
1148  003756  022706  000500                   CMP     #500,   SP      ;CHECK THE STACK POINTER
1149  003762  001404                           BEQ     ISA20           ;BRANCH IF OK
1150  003764  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1151  003770  104000                           HLT                     ;STACK POINTER FOULED UP
1152  003772  000443                           BR      END20           ;SKIP REST OF TEST
1153
1154  003774  022767  000344  174576  ISA20:  CMP     #344,   $PSW    ;CHECK PS AFTER FIS TRAP
1155  004002  001401                           BEQ     .+4             ;BRANCH IF OK
1156  004004  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 344
1157
1158  004006  022767  003736  174570          CMP     #RTA20, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
1159  004014  001401                           BEQ     .+4             ;BRANCH IF OK
1160  004016  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
1161
1162  004020  022767  000002  174560          CMP     #002,   ANS2    ;CHECK PS BEFORE FIS TRAP
1163  004026  001401                           BEQ     .+4             ;BRANCH IF OK
1164  004030  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 002
1165
1166  004032  022767  077452  174550          CMP     #077452,ANS3    ;CHECK DATA FROM THE STACK
1167  004040  001401                           BEQ     .+4             ;BRANCH IF OK
1168  004042  104004                           HLT+4                   ;DATA ON STACK (077452) CHANGED
1169
1170  004044  022767  125252  174540          CMP     #125252,ANS4    ;CHECK DATA FROM STACK
1171  004052  001401                           BEQ     .+4             ;BRANCH IF OK
1172  004054  104004                           HLT+4                   ;DATA ON STACK (125252) CHANGED
1173
1174  004056  022767  077652  174530          CMP     #077652,ANS5    ;CHECK DATA FROM STACK
1175  004064  001401                           BEQ     .+4             ;BRANCH IF OK
1176  004066  104006                           HLT+6                   ;DATA ON STACK (077652) CHANGED
1177
1178  004070  022767  125253  174520          CMP     #125253,ANS6    ;CHECK DATA FROM STACK
1179  004076  001401                           BEQ     .+4             ;BRANCH IF OK
1180  004100  104006                           HLT+6                   ;DATA ON STACK (125253) CHANGED
1181
```

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1182  004102  122767  000020  174670  END20:  CMPB    #20,    ICNT    ;CHECK THE TEST NUMBER
1183  004110  001401                          BEQ     .+4             ;BRANCH IF OK
1184  004112  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1185
1186  004114  104400                          SCOPE
1187
1188
1189                                  ;*************************************************************************
1190                                  ;TEST 21:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1191                                  ;       177520,017552 - 135352,051107 = 177520,017552
1192                                  ;       PS = 050,       STACK POINTER = R1
1193                                  ;*************************************************************************
1194
1195  004116  004567  012166          TST21:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
1196  004122  135352  051107                  .WORD   135352,051107   ;SECOND OPERAND ON TOP
1197  004126  177520  017552                  .WORD   177520,017552   ;FIRST OPERAND ON BOTTOM
1198  004132  000040                          .WORD   040             ;PROCESSOR PRIORITY LEVEL
1199  004134  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1200  004140  012701  000630                  MOV     #STACK0,R1      ;SET UP STACK POINTER
1201
1202  004144  000240                          NOP
1203  004146  075011                          FSUB+   R1              ;FLOATING SUBTRACT ON THE R1 STACK
1204
1205  004150  004767  012166                  JSR     PC,     POPR    ;POP THE ANSWER
1206  004154  010167  174422                  MOV     R1,     $SP     ;SAVE "STACK POINTER"
1207  004160  022767  000050  174412          CMP     #050,   $PSW    ;CHECK PS (EXCEPT T BIT)
1208  004166  001401                          BEQ     .+4             ;BRANCH IF OK
1209  004170  104000                          HLT                     ;PS NOT EQUAL TO 050
1210
1211  004172  022767  000634  174402          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R1)
1212  004200  001401                          BEQ     .+4             ;BRANCH IF OK
1213  004202  104000                          HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK4
1214
1215  004204  022767  177520  174372          CMP     #177520,ANS1    ;CHECK FIRST HALF OF ANSWER
1216  004212  001401                          BEQ     .+4             ;BRANCH IF OK
1217  004214  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 177520
1218
1219  004216  022767  017552  174362          CMP     #017552,ANS2    ;CHECK SECOND HALF OF ANSWER
1220  004224  001401                          BEQ     .+4             ;BRANCH IF OK
1221  004226  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 017552
1222
1223  004230  122767  000021  174542  END21:  CMPB    #21,    ICNT    ;CHECK THE TEST NUMBER
1224  004236  001401                          BEQ     .+4             ;BRANCH IF OK
1225  004240  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1226
1227  004242  104400                          SCOPE
1228
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1229
1230                                    ;*************************************************************************
1231                                    ;TEST 22:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1232                                    ;       125252,125252 - 125252,125253 = 017400,000000
1233                                    ;       PS = 040,       STACK POINTER = R0
1234                                    ;*************************************************************************
1235
1236  004244  004567  012040           TST22:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
1237  004250  125252  125253                   .WORD   125252,125253   ;SECOND OPERAND ON TOP
1238  004254  125252  125252                   .WORD   125252,125252   ;FIRST OPERAND ON BOTTOM
1239  004260  000047                           .WORD   047             ;PROCESSOR PRIORITY LEVEL
1240  004262  016704  000340                   .WORD   TRAPER,340      ;FIS TRAP VECTOR
1241  004266  012700  000630                   MOV     #STACK0,R0      ;SET UP STACK POINTER
1242
1243  004272  000240                           NOP
1244  004274  075010                           FSUB+   R0              ;FLOATING SUBTRACT ON THE R0 STACK
1245
1246  004276  004767  012040                   JSR     PC,     POPR    ;POP THE ANSWER
1247  004302  010067  174274                   MOV     R0,     $SP     ;SAVE "STACK POINTER"
1248  004306  022767  000040  174264           CMP     #040,   $PSW    ;CHECK PS (EXCEPT T BIT)
1249  004314  001401                           BEQ     .+4             ;BRANCH IF OK
1250  004316  104000                           HLT                     ;PS NOT EQUAL TO 040
1251
1252  004320  022767  000634  174254           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R0)
1253  004326  001401                           BEQ     .+4             ;BRANCH IF OK
1254  004330  104000                           HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK4
1255
1256  004332  022767  017400  174244           CMP     #017400,ANS1    ;CHECK FIRST HALF OF ANSWER
1257  004340  001401                           BEQ     .+4             ;BRANCH IF OK
1258  004342  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 017400
1259
1260  004344  005767  174236                   TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1261  004350  001401                           BEQ     .+4             ;BRANCH IF OK
1262  004352  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 000000
1263
1264  004354  122767  000022  174416  TN022:  CMPB    #22,    ICNT    ;CHECK THE TEST NUMBER
1265  004362  001401                           BEQ     .+4             ;BRANCH IF OK
1266  004364  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1267
1268  004366  104400                           SCOPE
1269
```

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1270
1271                                    ;*****************************************************************
1272                                    ;TEST 23:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1273                                    ;       002460,123456 - 100177,177777 = 002460,123456
1274                                    ;       PS = 000,       STACK POINTER = SP
1275                                    ;*****************************************************************
1276
1277  004370  004567  011536           TST23:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1278  004374  100177  177777                   .WORD   100177,177777   ;SECOND OPERAND ON TOP
1279  004400  002460  123456                   .WORD   002460,123456   ;FIRST OPERAND ON BOTTOM
1280  004404  000015                           .WORD   015             ;PROCESSOR PRIORITY LEVEL
1281  004406  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1282
1283  004412  000240                           NOP
1284  004414  075016                           FSUB+   SP              ;FLOATING SUBTRACT ON THE STACK
1285
1286  004416  004767  011550                   JSR     PC,     POPS    ;POP THE ANSWER
1287  004422  022706  000500                   CMP     #500,   SP      ;CHECK THE STACK POINTER
1288  004426  001404                           BEQ     TSA23           ;BRANCH IF OK
1289  004430  012706  000500                   MOV     #500,   SP      ;RESTORE STACK POINTER
1290  004434  104000                           HLT                     ;STACK POINTER FOULED UP
1291  004436  000417                           BR      END23           ;SKIP REST OF TEST
1292
1293  004440  022767  000000  174132  TSA23:  CMP     #000,   SPSW    ;CHECK PS (EXCEPT T BIT)
1294  004446  001401                           BEQ     .+4             ;BRANCH IF OK
1295  004450  104000                           HLT                     ;PS NOT EQUAL TO 000
1296
1297  004452  022767  002460  174124          CMP     #002460,ANS1    ;CHECK FIRST HALF OF ANSWER
1298  004460  001401                           BEQ     .+4             ;BRANCH IF OK
1299  004462  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 002460
1300
1301  004464  022767  123456  174114          CMP     #123456,ANS2    ;CHECK SECOND HALF OF ANSWER
1302  004472  001401                           BEQ     .+4             ;BRANCH IF OK
1303  004474  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 123456
1304
1305  004476  122767  000023  174274  END23:  CMPB    #23,    ICNT    ;CHECK THE TEST NUMBER
1306  004504  001401                           BEQ     .+4             ;BRANCH IF OK
1307  004506  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1308
1309  004510  104400                           SCOPE
1310
```

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1311
1312                                    ;*************************************************************************
1313                                    ;TEST 24:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1314                                    ;       000425,052525 - 000252,125252 = 000200,000000
1315                                    ;       PS = 200,       STACK POINTER = R4
1316                                    ;*************************************************************************
1317
1318  004512  004567  011572           TST24:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
1319  004516  000252  125252                   .WORD   000252,125252   ;SECOND OPERAND ON TOP
1320  004522  000425  052525                   .WORD   000425,052525   ;FIRST OPERAND ON BOTTOM
1321  004526  000217                           .WORD   217             ;PROCESSOR PRIORITY LEVEL
1322  004530  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1323  004534  012704  000630                   MOV     #STACK0,R4      ;SET UP STACK POINTER
1324
1325  004540  000240                           NOP
1326  004542  075014                           FSUB+   R4              ;FLOATING SUBTRACT ON THE R4 STACK
1327
1328  004544  004767  011572                   JSR     PC,     POPR    ;POP THE ANSWER
1329  004550  010467  174026                   MOV     R4,     $SP     ;SAVE "STACK POINTER"
1330  004554  022767  000200  174016           CMP     #200,   $PSW    ;CHECK PS (EXCEPT T BIT)
1331  004562  001401                           BEQ     .+4             ;BRANCH IF OK
1332  004564  104000                           HLT                     ;PS NOT EQUAL TO 200
1333
1334  004566  022767  000634  174006           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R4)
1335  004574  001401                           BEQ     .+4             ;BRANCH IF OK
1336  004576  104000                           HLT                     ;STACK POINTER (R4) NOT EQUAL TO #STACK4
1337
1338  004600  022767  000200  173776           CMP     #000200,ANS1    ;CHECK FIRST HALF OF ANSWER
1339  004606  001401                           BEQ     .+4             ;BRANCH IF OK
1340  004610  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 000200
1341
1342  004612  005767  173770                   TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1343  004616  001401                           BEQ     .+4             ;BRANCH IF OK
1344  004620  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 000000
1345
1346  004622  122767  000024  174150  END24:  CMPB    #24,    ICNT    ;CHECK THE TEST NUMBER
 347  004630  001401                           BEQ     .+4             ;BRANCH IF OK
1348  004632  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1349
1350  004634  104400                           SCOPE
1351
```

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1352
1353                                    ;*************************************************************************
1354                                    ;TEST 25:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1355                                    ;       000425,052525 - 000252,125253 ==> UNDERFLOW
1356                                    ;       PS(ON STACK) = 252,     STACK POINTER = SP
1357                                    ;*************************************************************************
1358
1359  004636  004567  011270           TST25:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1360  004642  000252  125253                   .WORD   000252,125253   ;SECOND OPERAND ON TOP
1361  004646  000425  052525                   .WORD   000425,052525   ;FIRST OPERAND ON BOTTOM
1362  004652  000257                           .WORD   257             ;PROCESSOR PRIORITY LEVEL
1363  004654  004700  000340                   .WORD   ISR25,  340     ;FIS TRAP VECTOR
1364
1365  004660  000240                           NOP
1366  004662  075016                           FSUB+   SP              ;FLOATING SUBTRACT ON THE STACK
1367
1368  004664  004767  011302           RTA25:  JSR     %7,     POPS    ;POP THE "ANSWER"
1369  004670  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
1370  004672  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1371  004676  000454                           BR      END25
1372
1373  004700  004767  011322           ISR25:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
1374  004704  022706  000500                   CMP     #500,   SP      ;CHECK THE STACK POINTER
1375  004710  001404                           BEQ     ISA25           ;BRANCH IF OK
1376  004712  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1377  004716  104000                           HLT                     ;STACK POINTER FOULED UP
1378  004720  000443                           BR      END25           ;SKIP REST OF TEST
1379
1380  004722  022767  000340  173650  ISA25:  CMP     #340,   $PSW    ;CHECK PS AFTER FIS TRAP
1381  004730  001401                           BEQ     .+4             ;BRANCH IF OK
1382  004732  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 340
1383
1384  004734  022767  004664  173642           CMP     #RTA25, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
1385  004742  001401                           BEQ     .+4             ;BRANCH IF OK
1386  004744  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
1387
1388  004746  022767  000252  173632           CMP     #252,   ANS2    ;CHECK PS BEFORE FIS TRAP
1389  004754  001401                           BEQ     .+4             ;BRANCH IF OK
1390  004756  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 252
1391
1392  004760  022767  000252  173622           CMP     #000252,ANS3    ;CHECK DATA FROM THE STACK
1393  004766  001401                           BEQ     .+4             ;BRANCH IF OK
1394  004770  104004                           HLT+4                   ;DATA ON STACK (000252) CHANGED
1395
1396  004772  022767  125253  173612           CMP     #125253,ANS4    ;CHECK DATA FROM STACK
1397  005000  001401                           BEQ     .+4             ;BRANCH IF OK
1398  005002  104004                           HLT+4                   ;DATA ON STACK (125253) CHANGED
1399
1400  005004  022767  000425  173602           CMP     #000425,ANS5    ;CHECK DATA FROM STACK
1401  005012  001401                           BEQ     .+4             ;BRANCH IF OK
1402  005014  104006                           HLT+6                   ;DATA ON STACK (000425) CHANGED
1403
1404  005016  022767  052525  173572           CMP     #052525,ANS6    ;CHECK DATA FROM STACK
1405  005024  001401                           BEQ     .+4             ;BRANCH IF OK
1406  005026  104006                           HLT+6                   ;DATA ON STACK (052525) CHANGED
1407
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```
1408  005030  122767  000025  173742  END25:  CMPB    #25.    ICNT    ;CHECK THE TEST NUMBER
1409  005036  001401                          BEQ     .+4             ;BRANCH IF OK
1410  005040  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1411
1412  005042  104400                          SCOPE
1413
1414
1415                                  ;*************************************************************************
1416                                  ;TEST 26:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1417                                  ;       177452,125252 - 077652,125252 = 177777,177777
1418                                  ;       PS = 350,       STACK POINTER = SP
1419                                  ;*************************************************************************
1420
1421  005044  004567  011062          TST26:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1422  005050  077652  125252                  .WORD   077652,125252   ;SECOND OPERAND ON TOP
1423  005054  177452  125252                  .WORD   177452,125252   ;FIRST OPERAND ON BOTTOM
1424  005060  000357                          .WORD   357             ;PROCESSOR PRIORITY LEVEL
1425  005062  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1426
1427  005066  000240                          NOP
1428  005070  075016                          FSUB+   SP              ;FLOATING SUBTRACT ON THE STACK
1429
1430  005072  004767  011074                  JSR     PC,     POPS    ;POP THE ANSWER
1431  005076  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
1432  005102  001404                          BEQ     TSA26           ;BRANCH IF OK
1433  005104  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
1434  005110  104000                          HLT                     ;STACK POINTER FOULED UP
1435  005112  000417                          BR      END26           ;SKIP REST OF TEST
1436
1437  005114  022767  000350  173456  TSA26:  CMP     #350,   $PSW    ;CHECK PS (EXCEPT T BIT)
1438  005122  001401                          BEQ     .+4             ;BRANCH IF OK
1439  005124  104000                          HLT                     ;PS NOT EQUAL TO 350
1440
1441  005126  022767  177777  173450          CMP     #177777,ANS1    ;CHECK FIRST HALF OF ANSWER
1442  005134  001401                          BEQ     .+4             ;BRANCH IF OK
1443  005136  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 177777
1444
1445  005140  022767  177777  173440          CMP     #177777,ANS2    ;CHECK SECOND HALF OF ANSWER
1446  005146  001401                          BEQ     .+4             ;BRANCH IF OK
1447  005150  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 177777
1448
1449  005152  122767  000026  173620  END26:  CMPB    #26,    ICNT    ;CHECK THE TEST NUMBER
1450  005160  001401                          BEQ     .+4             ;BRANCH IF OK
1451  005162  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1452
1453  005164  104400                          SCOPE
1454
```

```
1455
1456                                    ;*****************************************************************************
1457                                    ;TEST 27:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1458                                    ;       077652,125253 - 177452,125252 ==> OVERFLOW
1459                                    ;       PS(ON STACK) = 002,     STACK POINTER = R3
1460                                    ;*****************************************************************************
1461
1462  005166  004567  011116       TST27:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R3 STACK, SET PRIORITY
1463  005172  177452  125252               .WORD   177452,125252   ;SECOND OPERAND ON TOP
1464  005176  077652  125253               .WORD   077652,125253   ;FIRST OPERAND ON BOTTOM
1465  005202  000015                       .WORD   015             ;PROCESSOR PRIORITY LEVEL
1466  005204  005234  000344               .WORD   ISR27,  344     ;FIS TRAP VECTOR
1467  005210  012703  000630               MOV     #STACK0,R3      ;SET UP R3 AS STACK POINTER
1468
1469  005214  000240                       NOP
1470  005216  075013                       FSUB+   R3              ;FLOATING SUBTRACT ON THE R3 STACK
1471
1472  005220  004767  011116       RTA27:  JSR     %7,     POPR    ;POP THE "ANSWER"
1473  005224  010367  173352               MOV     R3,     $SP     ;SAVE STACK POINTER (R3)
1474  005230  104002                       HLT+2                   ;FIS TRAP DIDN'T OCCURE!
1475  005232  000454                       BR      END27
1476
1477  005234  004767  011134       ISR27:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
1478  005240  010367  173336               MOV     R3,     $SP     ;SAVE STACK POINTER (R3)
1479  005244  022767  000344  173326       CMP     #344,   $PSW    ;CHECK PS AFTER FIS TRAP
1480  005252  001401                       BEQ     .+4             ;BRANCH IF OK
1481  005254  104000                       HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 344
1482
1483  005256  022767  000630  173316       CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R3)
1484  005264  001401                       BEQ     .+4             ;BRANCH IF OK
1485  005266  104000                       HLT                     ;STACK POINTER (R3) NOT EQUAL TO #STACK0
1486
1487  005270  022767  005220  173306       CMP     #RTA27, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
1488  005276  001401                       BEQ     .+4             ;BRANCH IF OK
1489  005300  104001                       HLT+1                   ;FIS TRAP AT WRONG ADDRESS
1490
1491  005302  022767  000002  173276       CMP     #002,   ANS2    ;CHECK PS BEFORE FIS TRAP
1492  005310  001401                       BEQ     .+4             ;BRANCH IF OK
1493  005312  104002                       HLT+2                   ;PS AT FIS TRAP TIME NOT 002
1494
1495  005314  022767  177452  173266       CMP     #177452,ANS3    ;CHECK DATA FROM THE STACK
1496  005322  001401                       BEQ     .+4             ;BRANCH IF OK
1497  005324  104004                       HLT+4                   ;DATA ON STACK (177452) CHANGED
1498
1499  005326  022767  125252  173256       CMP     #125252,ANS4    ;CHECK DATA FROM STACK
1500  005334  001401                       BEQ     .+4             ;BRANCH IF OK
1501  005336  104004                       HLT+4                   ;DATA ON STACK (125252) CHANGED
1502
1503  005340  022767  077652  173246       CMP     #077652,ANS5    ;CHECK DATA FROM STACK
1504  005346  001401                       BEQ     .+4             ;BRANCH IF OK
1505  005350  104006                       HLT+6                   ;DATA ON STACK (077652) CHANGED
1506
1507  005352  022767  125253  173236       CMP     #125253,ANS6    ;CHECK DATA FROM STACK
1508  005360  001401                       BEQ     .+4             ;BRANCH IF OK
1509  005362  104006                       HLT+6                   ;DATA ON STACK (125253) CHANGED
1510
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1511  005364  122767  000027  173406  END27:  CMPB    #27.    ICNT    ;CHECK THE TEST NUMBER
1512  005372  001401                          BEQ     .+4             ;BRANCH IF OK
1513  005374  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1514
1515  005376  104400                          SCOPE
1516
1517
1518                                  ;*************************************************************************
1519                                  ;TEST 30:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1520                                  ;       035152,125252 - 043125,052525 = 143125,052524
1521                                  ;       PS = 150,       STACK POINTER = R3
1522                                  ;*************************************************************************
1523
1524  005400  004567  010704          TST30:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R3 STACK, SET PRIORITY
1525  005404  043125  052525                  .WORD   043125,052525   ;SECOND OPERAND ON TOP
1526  005410  035152  125252                  .WORD   035152,125252   ;FIRST OPERAND ON BOTTOM
1527  005414  000147                          .WORD   147             ;PROCESSOR PRIORITY LEVEL
1528  005416  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1529  005422  012703  000630                  MOV     #STACK0,R3      ;SET UP STACK POINTER
1530
1531  005426  000240                          NOP
1532  005430  075013                          FSUB+   R3              ;FLOATING SUBTRACT ON THE R3 STACK
1533
1534  005432  004767  010704                  JSR     PC,     POPR    ;POP THE ANSWER
1535  005436  010367  173140                  MOV     R3,     $SP     ;SAVE "STACK POINTER"
1536  005442  022767  000150  173130          CMP     #150,   $PSW    ;CHECK PS (EXCEPT T BIT)
1537  005450  001401                          BEQ     .+4             ;BRANCH IF OK
1538  005452  104000                          HLT                     ;PS NOT EQUAL TO 150
1539
1540  005454  022767  000634  173120          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R3)
1541  005462  001401                          BEQ     .+4             ;BRANCH IF OK
1542  005464  104000                          HLT                     ;STACK POINTER (R3) NOT EQUAL TO #STACK4
1543
1544  005466  022767  143125  173110          CMP     #143125,ANS1    ;CHECK FIRST HALF OF ANSWER
1545  005474  001401                          BEQ     .+4             ;BRANCH IF OK
1546  005476  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 143125
1547
1548  005500  022767  052524  173100          CMP     #052524,ANS2    ;CHECK SECOND HALF OF ANSWER
1549  005506  001401                          BEQ     .+4             ;BRANCH IF OK
1550  005510  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 052524
1551
1552  005512  122767  000030  173260  END30:  CMPB    #30,    ICNT    ;CHECK THE TEST NUMBER
1553  005520  001401                          BEQ     .+4             ;BRANCH IF OK
1554  005522  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1555
1556  005524  104400                          SCOPE
1557
```

```
1558
1559                                    ;*************************************************************************
1560                                    ;TEST 31:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1561                                    ;       143325,052525 - 135152,125252 = 143325,052525
1562                                    ;       PS = 250,       STACK POINTER = R0
1563                                    ;*************************************************************************
1564
1565  005526  004567  010556            TST31:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
1566  005532  135152  125252                    .WORD   135152,125252   ;SECOND OPERAND ON TOP
1567  005536  143325  052525                    .WORD   143325,052525   ;FIRST OPERAND ON BOTTOM
1568  005542  000243                            .WORD   243             ;PROCESSOR PRIORITY LEVEL
1569  005544  016574  000340                    .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1570  005550  012700  000630                    MOV     #STACK0,R0      ;SET UP STACK POINTER
1571
1572  005554  000240                            NOP
1573  005556  075010                            FSUB+   R0              ;FLOATING SUBTRACT ON THE R0 STACK
1574
1575  005560  004767  010556                    JSR     PC,     POPR    ;POP THE ANSWER
1576  005564  010067  173012                    MOV     R0,     $SP     ;SAVE "STACK POINTER"
1577  005570  022767  000250  173002            CMP     #250,   $PSW    ;CHECK PS (EXCEPT T BIT)
1578  005576  001401                            BEQ     .+4             ;BRANCH IF OK
1579  005600  104000                            HLT                     ;PS NOT EQUAL TO 250
1580
1581  005602  022767  000634  172772            CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R0)
1582  005610  001401                            BEQ     .+4             ;BRANCH IF OK
1583  005612  104000                            HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK4
1584
1585  005614  022767  143325  172762            CMP     #143325,ANS1    ;CHECK FIRST HALF OF ANSWER
1586  005622  001401                            BEQ     .+4             ;BRANCH IF OK
1587  005624  104002                            HLT+2                   ;ANS1 NOT EQUAL TO 143325
1588
1589  005626  022767  052525  172752            CMP     #052525,ANS2    ;CHECK SECOND HALF OF ANSWER
1590  005634  001401                            BEQ     .+4             ;BRANCH IF OK
1591  005636  104002                            HLT+2                   ;ANS2 NOT EQUAL TO 052525
1592
1593  005640  122767  000031  173132  END31:   CMPB    #31,    ICNT    ;CHECK THE TEST NUMBER
1594  005646  001401                            BEQ     .+4             ;BRANCH IF OK
1595  005650  104000                            HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1596
1597  005652  104400                            SCOPE
1598
```

```
1599
1600                                    ;*************************************************************************
1601                                    ;TEST 32:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1602                                    ;       135152,125252 - 143325,052525 = 043325,052525
1603                                    ;       PS = 340,       STACK POINTER = R5
1604                                    ;*************************************************************************
1605
1606  005654  004567  010430           TST32:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R5 STACK, SET PRIORITY
1607  005660  143325  052525                   .WORD   143325,052525   ;SECOND OPERAND ON TOP
1608  005664  135152  125252                   .WORD   135152,125252   ;FIRST OPERAND ON BOTTOM
1609  005670  000357                           .WORD   357             ;PROCESSOR PRIORITY LEVEL
1610  005672  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1611  005676  012705  000630                   MOV     #STACK0,R5      ;SET UP STACK POINTER
1612
1613  005702  000240                           NOP
1614  005704  075015                           FSUB+   R5              ;FLOATING SUBTRACT ON THE R5 STACK
1515
1616  005706  004767  010430                   JSR     PC,     POPR    ;POP THE ANSWER
1617  005712  010567  172664                   MOV     R5,     $SP     ;SAVE "STACK POINTER"
1618  005716  022767  000340  172654           CMP     #340,   $PSW    ;CHECK PS (EXCEPT T BIT)
1619  005724  001401                           BEQ     .+4             ;BRANCH IF OK
1620  005726  104000                           HLT                     ;PS NOT EQUAL TO 340
1621
1622  005730  022767  000634  172644           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R5)
1623  005736  001401                           BEQ     .+4             ;BRANCH IF OK
1624  005740  104000                           HLT                     ;STACK POINTER (R5) NOT EQUAL TO #STACK4
1625
1626  005742  022767  043325  172634           CMP     #043325,ANS1    ;CHECK FIRST HALF OF ANSWER
1627  005750  001401                           BEQ     .+4             ;BRANCH IF OK
1628  005752  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 043325
1629
1630  005754  022767  052525  172624           CMP     #052525,ANS2    ;CHECK SECOND HALF OF ANSWER
1631  005762  001401                           BEQ     .+4             ;BRANCH IF OK
1632  005764  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 052525
1633
1634  005766  122767  000032  173004  END32:  CMPB    #32,    ICNT    ;CHECK THE TEST NUMBER
1635  005774  001401                           BEQ     .+4             ;BRANCH IF OK
1636  005776  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1637
1638  006000  104400                           SCOPE
1639
```

```
1640
1641                                    ;*************************************************************************
1642                                    ;TEST 33:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
1643                                    ;       043125,052525 - 035152,125252 = 043125,052524
1644                                    ;       PS = 040,       STACK POINTER = R2
1645                                    ;*************************************************************************
1646
1647  006002  004567  010302           TST33:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R2 STACK, SET PRIORITY
1648  006006  035152  125252                   .WORD   035152,125252   ;SECOND OPERAND ON TOP
1649  006012  043125  052525                   .WORD   043125,052525   ;FIRST OPERAND ON BOTTOM
1650  006016  000040                           .WORD   040             ;PROCESSOR PRIORITY LEVEL
1651  006020  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1652  006024  012702  000630                   MOV     #STACK0,R2      ;SET UP STACK POINTER
1653
1654  006030  000240                           NOP
1655  006032  075012                           FSUB+   R2              ;FLOATING SUBTRACT ON THE R2 STACK
1656
1657  006034  004767  010302                   JSR     PC,     POPR    ;POP THE ANSWER
1658  006040  010267  172536                   MOV     R2,     $SP     ;SAVE "STACK POINTER"
1659  006044  022767  000040  172526           CMP     #040,   $PSW    ;CHECK PS (EXCEPT T BIT)
1660  006052  001401                           BEQ     .+4             ;BRANCH IF OK
1661  006054  104000                           HLT                     ;PS NOT EQUAL TO 040
1662
1663  006056  022767  000634  172516           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R2)
1664  006064  001401                           BEQ     .+4             ;BRANCH IF OK
1665  006066  104000                           HLT                     ;STACK POINTER (R2) NOT EQUAL TO #STACK4
1666
1667  006070  022767  043125  172506           CMP     #043125,ANS1    ;CHECK FIRST HALF OF ANSWER
1668  006076  001401                           BEQ     .+4             ;BRANCH IF OK
1669  006100  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 043125
1670
1671  006102  022767  052524  172476           CMP     #052524,ANS2    ;CHECK SECOND HALF OF ANSWER
1672  006110  001401                           BEQ     .+4             ;BRANCH IF OK
1673  006112  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 052524
1674
1675  006114  122767  000033  172656  END33:  CMPB    #33,    ICNT    ;CHECK THE TEST NUMBER
1676  006122  001401                           BEQ     .+4             ;BRANCH IF OK
1677  006124  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1678
1679  006126  104400                           SCOPE
1680
```

```
1681
1682                            ;*************************************************************************
1683                            ;TEST 34:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1684                            ;       000000,000000 * 000000,000000 = 000000,000000
1685                            ;       PS = 104,       STACK POINTER = R4
1686                            ;*************************************************************************
1687
1688  006130  004567  010154       TST34:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
1689  006134  000000  000000               .WORD   000000,000000   ;SECOND OPERAND ON TOP
1690  006140  000000  000000               .WORD   000000,000000   ;FIRST OPERAND ON BOTTOM
1691  006144  000111                       .WORD   111             ;PROCESSOR PRIORITY LEVEL
1692  006146  016574  000340               .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1693  006152  012704  000630               MOV     #STACK0,R4      ;SET UP STACK POINTER
1694
1695  006156  000240                       NOP
1696  006160  075024                       FMUL+   R4              ;FLOATING MULTIPLY ON THE R4 STACK
1697
1698  006162  004767  010154               JSR     PC,     POPR    ;POP THE ANSWER
1699  006166  010467  172410               MOV     R4,     $SP     ;SAVE "STACK POINTER"
1700  006172  022767  000104  172400       CMP     #104,   $PSW    ;CHECK PS (EXCEPT T BIT)
1701  006200  001401                       BEQ     .+4             ;BRANCH IF OK
1702  006202  104000                       HLT                     ;PS NOT EQUAL TO 104
1703
1704  006204  022767  000634  172370       CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R4)
1705  006212  001401                       BEQ     .+4             ;BRANCH IF OK
1706  006214  104000                       HLT                     ;STACK POINTER (R4) NOT EQUAL TO #STACK4
1707
1708  006216  005767  172362               TST     ANS1            ;CHECK FIRST HALF OF ANSWER
1709  006222  001401                       BEQ     .+4             ;BRANCH IF OK
1710  006224  104002                       HLT+2                   ;ANS1 NOT EQUAL TO 000000
1711
1712  006226  005767  172354               TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1713  006232  001401                       BEQ     .+4             ;BRANCH IF OK
1714  006234  104002                       HLT+2                   ;ANS2 NOT EQUAL TO 000000
1715
1716  006236  122767  000034  172534 END34:  CMPB    #34,    ICNT    ;CHECK THE TEST NUMBER
1717  006244  001401                       BEQ     .+4             ;BRANCH IF OK
1718  006246  104000                       HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1719
1720  006250  104400 ,                     SCOPE
1721
```

```
1722
1723                                    ;*************************************************************************
1724                                    ;TEST 35:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1725                                    ;       140200,000000 * 052345,123456 = 152345,123456
1726                                    ;       PS = 350,       STACK POINTER = R2
1727                                    ;*************************************************************************
1728
1729  006252  004567  010032           TST35:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R2 STACK, SET PRIORITY
1730  006256  052345  123456                   .WORD   052345,123456   ;SECOND OPERAND ON TOP
1731  006262  140200  000000                   .WORD   140200,000000   ;FIRST OPERAND ON BOTTOM
1732  006266  000343                           .WORD   343             ;PROCESSOR PRIORITY LEVEL
1733  006270  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1734  006274  012702  000630                   MOV     #STACK0,R2      ;SET UP STACK POINTER
1735
1736  006300  000240                           NOP
1737  006302  075022                           FMUL+   R2              ;FLOATING MULTIPLY ON THE R2 STACK
1738
1739  006304  004767  010032                   JSR     PC,     POPR    ;POP THE ANSWER
1740  006310  010267  172266                   MOV     R2,     $SP     ;SAVE "STACK POINTER"
1741  006314  022767  000350  172256           CMP     #350,   $PSW    ;CHECK PS (EXCEPT T BIT)
1742  006322  001401                           BEQ     .+4             ;BRANCH IF OK
1743  006324  104000                           HLT                     ;PS NOT EQUAL TO 350
1744
1745  006326  022767  000634  172246           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R2)
1746  006334  001401                           BEQ     .+4             ;BRANCH IF OK
1747  006336  104000                           HLT                     ;STACK POINTER (R2) NOT EQUAL TO #STACK4
1748
1749  006340  022767  152345  172236           CMP     #152345,ANS1    ;CHECK FIRST HALF OF ANSWER
1750  006346  001401                           BEQ     .+4             ;BRANCH IF OK
1751  006350  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 152345
1752
1753  006352  022767  123456  172226           CMP     #123456,ANS2    ;CHECK SECOND HALF OF ANSWER
1754  006360  001401                           BEQ     .+4             ;BRANCH IF OK
1755  006362  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 123456
1756
1757  006364  122767  000035  172406  END35:  CMPB    #35,    ICNT    ;CHECK THE TEST NUMBER
1758  006372  001401                           BEQ     .+4             ;BRANCH IF OK
1759  006374  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1760
1761  006376  104400                           SCOPE
1762
```

```
1763
1764                                    ;*****************************************************************
1765                                    ;TEST 36:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1766                                    ;       100125,052525 * 135753,024642 = 000000,000000
1767                                    ;       PS = 104,       STACK POINTER = R5
1768                                    ;*****************************************************************
1769
1770  006400  004567  007704           TST36:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R5 STACK, SET PRIORITY
1771  006404  135753  024642                   .WORD   135753,024642   ;SECOND OPERAND ON TOP
1772  006410  100125  052525                   .WORD   100125,052525   ;FIRST OPERAND ON BOTTOM
1773  006414  000117                           .WORD   117             ;PROCESSOR PRIORITY LEVEL
1774  006416  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1775  006422  012705  000630                   MOV     #STACK0,R5      ;SET UP STACK POINTER
1776
1777  006426  000240                           NOP
1778  006430  075025                           FMUL+   R5              ;FLOATING MULTIPLY ON THE R5 STACK
1779
1780  006432  004767  007704                   JSR     PC,     POPR    ;POP THE ANSWER
1781  006436  010567  172140                   MOV     R5,     $SP     ;SAVE "STACK POINTER"
1782  006442  022767  000104  172130           CMP     #104,   $PSW    ;CHECK PS (EXCEPT T BIT)
1783  006450  001401                           BEQ     .+4             ;BRANCH IF OK
1784  006452  104000                           HLT                     ;PS NOT EQUAL TO 104
1785
1786  006454  022767  000634  172120           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R5)
1787  006462  001401                           BEQ     .+4             ;BRANCH IF OK
1788  006464  104000                           HLT                     ;STACK POINTER (R5) NOT EQUAL TO #STACK4
1789
1790  006466  005767  172112                   TST     ANS1            ;CHECK FIRST HALF OF ANSWER
1791  006472  001401                           BEQ     .+4             ;BRANCH IF OK
1792  006474  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 000000
1793
1794  006476  005767  172104                   TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1795  006502  001401                           BEQ     .+4             ;BRANCH IF OK
1796  006504  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 000000
1797
1798  006506  122767  000036  172264  END36:  CMPB    #36,    ICNT    ;CHECK THE TEST NUMBER
1799  006514  001401                           BEQ     .+4             ;BRANCH IF OK
1800  006516  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1801
1802  006520  104400                           SCOPE
1803
```

```
1804
1805                                    ;*************************************************************************
1806                                    ;TEST 37:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1807                                    ;       161616,161616 * 000052,125252 = 000000,000000
1808                                    ;       PS = 204,       STACK POINTER = R3
1809                                    ;*************************************************************************
1810
1811  006522  004567  007562           TST37:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R3 STACK, SET PRIORITY
1812  006526  000052  125252                   .WORD   000052,125252   ;SECOND OPERAND ON TOP
1813  006532  161616  161616                   .WORD   161616,161616   ;FIRST OPERAND ON BOTTOM
1814  006536  000217                           .WORD   217             ;PROCESSOR PRIORITY LEVEL
1815  006540  016574  000340                   .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1816  006544  012703  000630                   MOV     #STACK0,R3      ;SET UP STACK POINTER
1817
1818  006550  000240                           NOP
1819  006552  075023                           FMUL+   R3              ;FLOATING MULTIPLY ON THE R3 STACK
1820
1821  006554  004767  007562                   JSR     PC,     POPR    ;POP THE ANSWER
1822  006560  010367  172016                   MOV     R3,     $SP     ;SAVE "STACK POINTER"
1823  006564  022767  000204  172006           CMP     #204,   $PSW    ;CHECK PS (EXCEPT T BIT)
1824  006572  001401                           BEQ     .+4             ;BRANCH IF OK
1825  006574  104000                           HLT                     ;PS NOT EQUAL TO 204
1826
1827  006576  022767  000634  171776           CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R3)
1828  006604  001401                           BEQ     .+4             ;BRANCH IF OK
1829  006606  104000                           HLT                     ;STACK POINTER (R3) NOT EQUAL TO #STACK4
1830
1831  006610  005767  171770                   TST     ANS1            ;CHECK FIRST HALF OF ANSWER
1832  006614  001401                           BEQ     .+4             ;BRANCH IF OK
1833  006616  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 000000
1834
1835  006620  005767  171762                   TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1836  006624  001401                           BEQ     .+4             ;BRANCH IF OK
1837  006626  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 000000
1838
1839  006630  122767  000037  172142  END37:  CMPB    #37,    ICNT    ;CHECK THE TEST NUMBER
1840  006636  001401                           BEQ     .+4             ;BRANCH IF OK
1841  006640  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1842
1843  006642  104400                           SCOPE
1844
```

```
1845
1846                                    ;*************************************************************************
1847                                    ;TEST 40:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1848                                    ;       176452,125252 * 041500,000000 = 177777,177777
1849                                    ;       PS = 350,       STACK POINTER = SP
1850                                    ;*************************************************************************
1851
1852  006644  004567  007262       TST40:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1853  006650  041500  000000               .WORD   041500,000000   ;SECOND OPERAND ON TOP
1854  006654  176452  125252               .WORD   176452,125252   ;FIRST OPERAND ON BOTTOM
1855  006660  000357                       .WORD   357             ;PROCESSOR PRIORITY LEVEL
1856  006662  016574  000340               .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1857
1858  006666  000240                       NOP
1859  006670  075026                       FMUL+   SP              ;FLOATING MULTIPLY ON THE STACK
1860
1861  006672  004767  007274               JSR     PC,     POPS    ;POP THE ANSWER
1862  006676  022706  000500               CMP     #500,   SP      ;CHECK THE STACK POINTER
1863  006702  001404                       BEQ     TSA40           ;BRANCH IF OK
1864  006704  012706  000500               MOV     #500,   SP      ;RESTORE STACK POINTER
1865  006710  104000                       HLT                     ;STACK POINTER FOULED UP
1866  006712  000417                       BR      END40           ;SKIP REST OF TEST
1867
1868  006714  022767  000350  171656 TSA40:  CMP     #350,   $PSW    ;CHECK PS (EXCEPT T BIT)
1869  006722  001401                       BEQ     .+4             ;BRANCH IF OK
1870  006724  104000                       HLT                     ;PS NOT EQUAL TO 350
1871
1872  006726  022767  177777  171650       CMP     #177777,ANS1    ;CHECK FIRST HALF OF ANSWER
1873  006734  001401                       BEQ     .+4             ;BRANCH IF OK
1874  006736  104002                       HLT+2                   ;ANS1 NOT EQUAL TO 177777
1875
1876  006740  022767  177777  171640       CMP     #177777,ANS2    ;CHECK SECOND HALF OF ANSWER
1877  006746  001401                       BEQ     .+4             ;BRANCH IF OK
1878  006750  104002                       HLT+2                   ;ANS2 NOT EQUAL TO 177777
1879
1880  006752  122767  000040  172020 END40:  CMPB    #40,    ICNT    ;CHECK THE TEST NUMBER
1881  006760  001401                       BEQ     .+4             ;BRANCH IF OK
1882  006762  104000                       HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1883
1884  006764  104400                       SCOPE
1885
```

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1886
1887                                    ;*************************************************************************
1888                                    ;TEST 41:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1889                                    ;       076452,125252 * 041500,000001 ==> OVERFLOW
1890                                    ;       PS(ON STACK) = 102,     STACK POINTER = SP
1891                                    ;*************************************************************************
1892
1893  006766  004567  007140           TST41:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
1894  006772  041500  000001                   .WORD   041500,000001   ;SECOND OPERAND ON TOP
1895  006776  076452  125252                   .WORD   076452,125252   ;FIRST OPERAND ON BOTTOM
1896  007002  000105                           .WORD   105             ;PROCESSOR PRIORITY LEVEL
1897  007004  007030  000357                   .WORD   ISR41,  357     ;FIS TRAP VECTOR
1898
1899  007010  000240                           NOP
1900  007012  075026                           FMUL+   SP              ;FLOATING MULTIPLY ON THE STACK
1901
1902  007014  004767  007152           RTA41:  JSR     %7,     POPS    ;POP THE "ANSWER"
1903  007020  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
1904  007022  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1905  007026  000454                           BR      END41
1906
1907  007030  004767  007172           ISR41:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
1908  007034  022706  000500                   CMP     #500,   SP      ;CHECK THE STACK POINTER
1909  007040  001404                           BEQ     ISA41           ;BRANCH IF OK
1910  007042  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
1911  007046  104000                           HLT                     ;STACK POINTER FOULED UP
1912  007050  000443                           BR      END41           ;SKIP REST OF TEST
1913
1914  007052  022767  000357  171520  ISA41:  CMP     #357,   $PSW    ;CHECK PS AFTER FIS TRAP
1915  007060  001401                           BEQ     .+4             ;BRANCH IF OK
1916  007062  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 357
1917
1918  007064  022767  007014  171512           CMP     #RTA41, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
1919  007072  001401                           BEQ     .+4             ;BRANCH IF OK
1920  007074  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
1921
1922  007076  022767  000102  171502           CMP     #102,   ANS2    ;CHECK PS BEFORE FIS TRAP
1923  007104  001401                           BEQ     .+4             ;BRANCH IF OK
1924  007106  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 102
1925
1926  007110  022767  041500  171472           CMP     #041500,ANS3    ;CHECK DATA FROM THE STACK
1927  007116  001401                           BEQ     .+4             ;BRANCH IF OK
1928  007120  104004                           HLT+4                   ;DATA ON STACK (041500) CHANGED
1929
1930  007122  022767  000001  171462           CMP     #000001,ANS4    ;CHECK DATA FROM STACK
1931  007130  001401                           BEQ     .+4             ;BRANCH IF OK
1932  007132  104004                           HLT+4                   ;DATA ON STACK (000001) CHANGED
1933
1934  007134  022767  076452  171452           CMP     #076452,ANS5    ;CHECK DATA FROM STACK
1935  007142  001401                           BEQ     .+4             ;BRANCH IF OK
1936  007144  104006                           HLT+6                   ;DATA ON STACK (076452) CHANGED
1937
1938  007146  022767  125252  171442           CMP     #125252,ANS6    ;CHECK DATA FROM STACK
1939  007154  001401                           BEQ     .+4             ;BRANCH IF OK
1940  007156  104006                           HLT+6                   ;DATA ON STACK (125252) CHANGED
1941
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1942  007160  122767  000041  171612  END41:  CMPB    #41,    ICNT    ;CHECK THE TEST NUMBER
1943  007166  001401                          BEQ     .+4             ;BRANCH IF OK
1944  007170  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1945
1946  007172  104400                          SCOPE
1947
1948
1949                                  ;*****************************************************************
1950                                  ;TEST 42:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1951                                  ;       124252,125252 * 114100,000001 = 000200,000000
1952                                  ;       PS = 200,       STACK POINTER = R1
1953                                  ;*****************************************************************
1954
1955  007174  004567  007110          TST42:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
1956  007200  114100  000001                  .WORD   114100,000001   ;SECOND OPERAND ON TOP
1957  007204  124252  125252                  .WORD   124252,125252   ;FIRST OPERAND ON BOTTOM
1958  007210  000200                          .WORD   200             ;PROCESSOR PRIORITY LEVEL
1959  007212  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
1960  007216  012701  000630                  MOV     #STACK0,R1      ;SET UP STACK POINTER
1961
1962  007222  000240                          NOP
1963  007224  075021                          FMUL+   R1              ;FLOATING MULTIPLY ON THE R1 STACK
1964
1965  007226  004767  007110                  JSR     PC,     POPR    ;POP THE ANSWER
1966  007232  010167  171344                  MOV     R1,     $SP     ;SAVE "STACK POINTER"
1967  007236  022767  000200  171334          CMP     #200,   $PSW    ;CHECK PS (EXCEPT T BIT)
1968  007244  001401                          BEQ     .+4             ;BRANCH IF OK
1969  007246  104000                          HLT                     ;PS NOT EQUAL TO 200
1970
1971  007250  022767  000634  171324          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R1)
1972  007256  001401                          BEQ     .+4             ;BRANCH IF OK
1973  007260  104000                          HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK4
1974
1975  007262  022767  000200  171314          CMP     #000200,ANS1    ;CHECK FIRST HALF OF ANSWER
1976  007270  001401                          BEQ     .+4             ;BRANCH IF OK
1977  007272  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 000200
1978
1979  007274  005767  171306                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
1980  007300  001401                          BEQ     .+4             ;BRANCH IF OK
1981  007302  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000
1982
1983  007304  122767  000042  171466  END42:  CMPB    #42,    ICNT    ;CHECK THE TEST NUMBER
1984  007312  001401                          BEQ     .+4             ;BRANCH IF OK
1985  007314  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
1986
1987  007316  104400                          SCOPE
1988
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1989
1990                                    ;*************************************************************************
1991                                    ;TEST 43:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
1992                                    ;       024252,125252 * 114100,000000 ==> UNDERFLOW
1993                                    ;       PS(ON STACK) = 312,     STACK POINTER = R0
1994                                    ;*************************************************************************
1995
1996  007320  004567  006764       TST43:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
1997  007324  114100  000000               .WORD   114100,000000   ;SECOND OPERAND ON TOP
1998  007330  024252  125252               .WORD   024252,125252   ;FIRST OPERAND ON BOTTOM
1999  007334  000305                       .WORD   305             ;PROCESSOR PRIORITY LEVEL
2000  007336  007366  000057               .WORD   ISR43,  057     ;FIS TRAP VECTOR
2001  007342  012700  000630               MOV     #STACK0,R0      ;SET UP R0 AS STACK POINTER
2002
2003  007346  000240                       NOP
2004  007350  075020                       FMUL+   R0              ;FLOATING MULTIPLY ON THE R0 STACK
2005
2006  007352  004767  006764       RTA43:  JSR     %7,     POPR    ;POP THE "ANSWER"
2007  007356  010067  171220               MOV     R0,     $SP     ;SAVE STACK POINTER (R0)
2008  007362  104002                       HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2009  007364  000453                       BR      END43
2010
2011  007366  004767  007002       ISR43:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
2012  007372  010067  171204               MOV     R0,     $SP     ;SAVE STACK POINTER (R0)
2013  007376  022767  000057  171174       CMP     #057,   $PSW    ;CHECK PS AFTER FIS TRAP
2014  007404  001401                       BEQ     .+4             ;BRANCH IF OK
2015  007406  104000                       HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 057
2016
2017  007410  022767  000630  171164       CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R0)
2018  007416  001401                       BEQ     .+4             ;BRANCH IF OK
2019  007420  104000                       HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK0
2020
2021  007422  022767  007352  171154       CMP     #RTA43, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2022  007430  001401                       BEQ     .+4             ;BRANCH IF OK
2023  007432  104001                       HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2024
2025  007434  022767  000312  171144       CMP     #312,   ANS2    ;CHECK PS BEFORE FIS TRAP
2026  007442  001401                       BEQ     .+4             ;BRANCH IF OK
2027  007444  104002                       HLT+2                   ;PS AT FIS TRAP TIME NOT 312
2028
2029  007446  022767  114100  171134       CMP     #114100,ANS3    ;CHECK DATA FROM THE STACK
2030  007454  001401                       BEQ     .+4             ;BRANCH IF OK
2031  007456  104004                       HLT+4                   ;DATA ON STACK (114100) CHANGED
2032
2033  007460  005767  171126               TST     ANS4            ;CHECK DATA FROM STACK
2034  007464  001401                       BEQ     .+4             ;BRANCH IF OK
2035  007466  104004                       HLT+4                   ;DATA ON STACK (000000) CHANGED
2036
2037  007470  022767  024252  171116       CMP     #024252,ANS5    ;CHECK DATA FROM STACK
2038  007476  001401                       BEQ     .+4             ;BRANCH IF OK
2039  007500  104006                       HLT+6                   ;DATA ON STACK (024252) CHANGED
2040
2041  007502  022767  125252  171106       CMP     #125252,ANS6    ;CHECK DATA FROM STACK
2042  007510  001401                       BEQ     .+4             ;BRANCH IF OK
2043  007512  104006                       HLT+6                   ;DATA ON STACK (125252) CHANGED
2044
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2045  007514  122767  000043  171256  END43:  CMPB    #43,    ICNT    ;CHECK THE TEST NUMBER
2046  007522  001401                          BEQ     .+4             ;BRANCH IF OK
2047  007524  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2048
2049  007526  104400                          SCOPE
2050
2051
2052                                  ;*************************************************************************
2053                                  ;TEST 44:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2054                                  ;       125252,125252 / 140200,000000 = 025252,125252
2055                                  ;       PS = 200,       STACK POINTER = SP
2056                                  ;*************************************************************************
2057
2058  007530  004567  006376          TST44:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2059  007534  140200  000000                  .WORD   140200,000000   ;SECOND OPERAND ON TOP
2060  007540  125252  125252                  .WORD   125252,125252   ;FIRST OPERAND ON BOTTOM
2061  007544  000217                          .WORD   217             ;PROCESSOR PRIORITY LEVEL
2062  007546  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
2063
2064  007552  000240                          NOP
2065  007554  075036                          FDIV+   SP              ;FLOATING DIVIDE ON THE STACK
2066
2067  007556  004767  006410                  JSR     PC,     POPS    ;POP THE ANSWER
2068  007562  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
2069  007566  001404                          BEQ     TSA44           ;BRANCH IF OK
2070  007570  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
2071  007574  104000                          HLT                     ;STACK POINTER FOULED UP
2072  007576  000417                          BR      END44           ;SKIP REST OF TEST
2073
2074  007600  022767  000200  170772  TSA44:  CMP     #200,   $PSW    ;CHECK PS (EXCEPT T BIT)
2075  007606  001401                          BEQ     .+4             ;BRANCH IF OK
2076  007610  104000                          HLT                     ;PS NOT EQUAL TO 200
2077
2078  007612  022767  025252  170764          CMP     #025252,ANS1    ;CHECK FIRST HALF OF ANSWER
2079  007620  001401                          BEQ     .+4             ;BRANCH IF OK
2080  007622  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 025252
2081
2082  007624  022767  125252  170754          CMP     #125252,ANS2    ;CHECK SECOND HALF OF ANSWER
2083  007632  001401                          BEQ     .+4             ;BRANCH IF OK
2084  007634  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 125252
2085
2086  007636  122767  000044  171134  END44:  CMPB    #44,    ICNT    ;CHECK THE TEST NUMBER
2087  007644  001401                          BEQ     .+4             ;BRANCH IF OK
2088  007646  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2089
2090  007650  104400                          SCOPE
2091
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2092
2093                                    ;*************************************************************************
2094                                    ;TEST 45:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2095                                    ;       052525,052525 / 100125,125252 ==> DIVIDE BY ZERO
2096                                    ;       PS(ON STACK) = 053,     STACK POINTER = R5
2097                                    ;*************************************************************************
2098
2099  007652  004567  006432           TST45:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R5 STACK, SET PRIORITY
2100  007656  100125  125252                   .WORD   100125,125252   ;SECOND OPERAND ON TOP
2101  007662  052525  052525                   .WORD   052525,052525   ;FIRST OPERAND ON BOTTOM
2102  007666  000047                           .WORD   047             ;PROCESSOR PRIORITY LEVEL
2103  007670  007720  000113                   .WORD   ISR45,  113     ;FIS TRAP VECTOR
2104  007674  012705  000630                   MOV     #STACK0,R5      ;SET UP R5 AS STACK POINTER
2105
2106  007700  000240                           NOP
2107  007702  075035                           FDIV+   R5              ;FLOATING DIVIDE ON THE R5 STACK
2108
2109  007704  004767  006432           RTA45:  JSR     %7,     POPR    ;POP THE "ANSWER"
2110  007710  010567  170666                   MOV     R5,     $SP     ;SAVE STACK POINTER (R5)
2111  007714  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2112  007716  000454                           BR      END45
2113
2114  007720  004767  006450           ISR45:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
2115  007724  010567  170652                   MOV     R5,     $SP     ;SAVE STACK POINTER (R5)
2116  007730  022767  000113  170642           CMP     #113,   $PSW    ;CHECK PS AFTER FIS TRAP
2117  007736  001401                           BEQ     .+4             ;BRANCH IF OK
2118  007740  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 113
2119
2120  007742  022767  000630  170632           CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R5)
2121  007750  001401                           BEQ     .+4             ;BRANCH IF OK
2122  007752  104000                           HLT                     ;STACK POINTER (R5) NOT EQUAL TO #STACK0
2123
2124  007754  022767  007704  170622           CMP     #RTA45, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2125  007760  001401                           BEQ     .+4             ;BRANCH IF OK
2126  007764  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2127
2128  007766  022767  000053  170612           CMP     #053,   ANS2    ;CHECK PS BEFORE FIS TRAP
2129  007774  001401                           BEQ     .+4             ;BRANCH IF OK
2130  007776  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 053
2131
2132  010000  022767  100125  170602           CMP     #100125,ANS3    ;CHECK DATA FROM THE STACK
2133  010006  001401                           BEQ     .+4             ;BRANCH IF OK
2134  010010  104004                           HLT+4                   ;DATA ON STACK (100125) CHANGED
2135
2136  010012  022767  125252  170572           CMP     #125252,ANS4    ;CHECK DATA FROM STACK
2137  010020  001401                           BEQ     .+4             ;BRANCH IF OK
2138  010022  104004                           HLT+4                   ;DATA ON STACK (125252) CHANGED
2139
2140  010024  022767  052525  170562           CMP     #052525,ANS5    ;CHECK DATA FROM STACK
2141  010032  001401                           BEQ     .+4             ;BRANCH IF OK
2142  010034  104006                           HLT+6                   ;DATA ON STACK (052525) CHANGED
2143
2144  010036  022767  052525  170552           CMP     #052525,ANS6    ;CHECK DATA FROM STACK
2145  010044  001401                           BEQ     .+4             ;BRANCH IF OK
2146  010046  104006                           HLT+6                   ;DATA ON STACK (052525) CHANGED
2147
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2148  010050  122767  000045  170722  END45:  CMPB    #45,    ICNT    ;CHECK THE TEST NUMBER
2149  010056  001401                          BEQ     .+4             ;BRANCH IF OK
2150  010060  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2151
2152  010062  104400                          SCOPE
2153
2154
2155                                  ;*************************************************************************
2156                                  ;TEST 46:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2157                                  ;       167452,125251 / 127652,125252 = 077777,177776
2158                                  ;       PS = 100,       STACK POINTER = R0
2159                                  ;*************************************************************************
2160
2161  010064  004567  006220          TST46:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
2162  010070  127652  125252                  .WORD   127652,125252   ;SECOND OPERAND ON TOP
2163  010074  167452  125251                  .WORD   167452,125251   ;FIRST OPERAND ON BOTTOM
2164  010100  000111                          .WORD   111             ;PROCESSOR PRIORITY LEVEL
2165  010102  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
2166  010106  012700  000630                  MOV     #STACK0,R0      ;SET UP STACK POINTER
2167
2168  010112  000240                          NOP
2169  010114  075030                          FDIV+   R0              ;FLOATING DIVIDE ON THE R0 STACK
2170
2171  010116  004767  006220                  JSR     PC,     POPR    ;POP THE ANSWER
2172  010122  010067  170454                  MOV     R0,     $SP     ;SAVE "STACK POINTER"
2173  010126  022767  000100  170444          CMP     #100,   $PSW    ;CHECK PS (EXCEPT T BIT)
2174  010134  001401                          BEQ     .+4             ;BRANCH IF OK
2175  010136  104000                          HLT                     ;PS NOT EQUAL TO 100
2176
2177  010140  022767  000634  170434          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R0)
2178  010146  001401                          BEQ     .+4             ;BRANCH IF OK
2179  010150  104000                          HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK4
2180
2181  010152  022767  077777  170424          CMP     #077777,ANS1    ;CHECK FIRST HALF OF ANSWER
2182  010160  001401                          BEQ     .+4             ;BRANCH IF OK
2183  010162  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 077777
2184
2185  010164  022767  177776  170414          CMP     #177776,ANS2    ;CHECK SECOND HALF OF ANSWER
2186  010172  001401                          BEQ     .+4             ;BRANCH IF OK
2187  010174  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 177776
2188
2189  010176  122767  000046  170574  END46:  CMPB    #46,    ICNT    ;CHECK THE TEST NUMBER
2190  010204  001401                          BEQ     .+4             ;BRANCH IF OK
2191  010206  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2192
2193  010210  104400                          SCOPE
2194
```

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2195
2196                                    ;*************************************************************************
2197                                    ;TEST 47:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2198                                    ;       067452,125252 / 127652,125252 ==> OVERFLOW
2199                                    ;       PS(ON STACK) = 242,     STACK POINTER = R4
2200                                    ;*************************************************************************
2201
2202  010212  004567  006072           TST47:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
2203  010216  127652  125252                   .WORD   127652,125252   ;SECOND OPERAND ON TOP
2204  010222  067452  125252                   .WORD   067452,125252   ;FIRST OPERAND ON BOTTOM
2205  010226  000242                           .WORD   242             ;PROCESSOR PRIORITY LEVEL
2206  010230  010260  000357                   .WORD   ISR47,  357     ;FIS TRAP VECTOR
2207  010234  012704  000630                   MOV     #STACK0,R4      ;SET UP R4 AS STACK POINTER
2208
2209  010240  000240                           NOP
2210  010242  075034                           FDIV+   R4              ;FLOATING DIVIDE ON THE R4 STACK
2211
2212  010244  004767  006072           RTA47:  JSR     %7,     POPR    ;POP THE "ANSWER"
2213  010250  010467  170326                   MOV     R4,     $SP     ;SAVE STACK POINTER (R4)
2214  010254  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2215  010256  000454                           BR      END47
2216
2217  010260  004767  006110           ISR47:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
2218  010264  010467  170312                   MOV     R4,     $SP     ;SAVE STACK POINTER (R4)
2219  010270  022767  000357  170302           CMP     #357,   $PSW    ;CHECK PS AFTER FIS TRAP
2220  010276  001401                           BEQ     .+4             ;BRANCH IF OK
2221  010300  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 357
2222
2223  010302  022767  000630  170272           CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R4)
2224  010310  001401                           BEQ     .+4             ;BRANCH IF OK
2225  010312  104000                           HLT                     ;STACK POINTER (R4) NOT EQUAL TO #STACK0
2226
2227  010314  022767  010244  170262           CMP     #RTA47, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2228  010322  001401                           BEQ     .+4             ;BRANCH IF OK
2229  010324  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2230
2231  010326  022767  000242  170252           CMP     #242,   ANS2    ;CHECK PS BEFORE FIS TRAP
2232  010334  001401                           BEQ     .+4             ;BRANCH IF OK
2233  010336  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 242
2234
2235  010340  022767  127652  170242           CMP     #127652,ANS3    ;CHECK DATA FROM THE STACK
2236  010346  001401                           BEQ     .+4             ;BRANCH IF OK
2237  010350  104004                           HLT+4                   ;DATA ON STACK (127652) CHANGED
2238
2239  010352  022767  125252  170232           CMP     #125252,ANS4    ;CHECK DATA FROM STACK
2240  010360  001401                           BEQ     .+4             ;BRANCH IF OK
2241  010362  104004                           HLT+4                   ;DATA ON STACK (125252) CHANGED
2242
2243  010364  022767  067452  170222           CMP     #067452,ANS5    ;CHECK DATA FROM STACK
2244  010372  001401                           BEQ     .+4             ;BRANCH IF OK
2245  010374  104006                           HLT+6                   ;DATA ON STACK (067452) CHANGED
2246
2247  010376  022767  125252  170212           CMP     #125252,ANS6    ;CHECK DATA FROM STACK
2248  010404  001401                           BEQ     .+4             ;BRANCH IF OK
2249  010406  104006                           HLT+6                   ;DATA ON STACK (125252) CHANGED
2250
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2251  010410  122767  000047  170362  END47:  CMPB    #47,    ICNT    ;CHECK THE TEST NUMBER
2252  010416  001401                          BEQ     .+4             ;BRANCH IF OK
2253  010420  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2254
2255  010422  104400                          SCOPE
2256
2257
2258                                  ;*************************************************************************
2259                                  ;TEST 50:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2260                                  ;       167452,125252 / 027652,125253 = 177777,177777
2261                                  ;       PS = 310,       STACK POINTER = SP
2262                                  ;*************************************************************************
2263
2264  010424  004567  005502          TST50:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2265  010430  027652  125253                  .WORD   027652,125253   ;SECOND OPERAND ON TOP
2266  010434  167452  125252                  .WORD   167452,125252   ;FIRST OPERAND ON BOTTOM
2267  010440  000300                          .WORD   300             ;PROCESSOR PRIORITY LEVEL
2268  010442  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
2269
2270  010446  000240                          NOP
2271  010450  075036                          FDIV+   SP              ;FLOATING DIVIDE ON THE STACK
2272
2273  010452  004767  005514                  JSR     PC,     POPS    ;POP THE ANSWER
2274  010456  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
2275  010462  001404                          BEQ     TSA50           ;BRANCH IF OK
2276  010464  012706  000500                  MOV     #500,   SP      ;RESTORE STACK POINTER
2277  010470  104000                          HLT                     ;STACK POINTER FOULED UP
2278  010472  000417                          BR      END50           ;SKIP REST OF TEST
2279
2280  010474  022767  000310  170076  TSA50:  CMP     #310,   $PSW    ;CHECK PS (EXCEPT T BIT)
2281  010502  001401                          BEQ     .+4             ;BRANCH IF OK
2282  010504  104000                          HLT                     ;PS NOT EQUAL TO 310
2283
2284  010506  022767  177777  170070          CMP     #177777,ANS1    ;CHECK FIRST HALF OF ANSWER
2285  010514  001401                          BEQ     .+4             ;BRANCH IF OK
2286  010516  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 177777
2287
2288  010520  022767  177777  170060          CMP     #177777,ANS2    ;CHECK SECOND HALF OF ANSWER
2289  010526  001401                          BEQ     .+4             ;BRANCH IF OK
2290  010530  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 177777
2291
2292  010532  122767  000050  170240  END50:  CMPB    #50,    ICNT    ;CHECK THE TEST NUMBER
2293  010540  001401                          BEQ     .+4             ;BRANCH IF OK
2294  010542  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2295
2296  010544  104400                          SCOPE
2297
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2298
2299                                    ;*************************************************************************
2300                                    ;TEST 51:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2301                                    ;       154200,000000 / 014377,177777 ==> OVERFLOW
2302                                    ;       PS(ON STACK) = 242,     STACK POINTER = SP
2303                                    ;*************************************************************************
2304
2305  010546  004567  005360           TST51:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2306  010552  014377  177777                   .WORD   014377,177777   ;SECOND OPERAND ON TOP
2307  010556  154200  000000                   .WORD   154200,000000   ;FIRST OPERAND ON BOTTOM
2308  010562  000246                           .WORD   246             ;PROCESSOR PRIORITY LEVEL
2309  010564  010610  000103                   .WORD   ISR51,  103     ;FIS TRAP VECTOR
2310
2311  010570  000240                           NOP
2312  010572  075036                           FDIV+   SP              ;FLOATING DIVIDE ON THE STACK
2313
2314  010574  004767  005372           RTA51:  JSR     %7,     POPS    ;POP THE "ANSWER"
2315  010600  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2316  010602  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
2317  010606  000453                           BR      END51
2318
2319  010610  004767  005412           ISR51:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
2320  010614  022706  000500                   CMP     #500,   SP      ;CHECK THE STACK POINTER
2321  010620  001404                           BEQ     ISA51           ;BRANCH IF OK
2322  010622  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK POINTER
2323  010626  104000                           HLT                     ;STACK POINTER FOULED UP
2324  010630  000442                           BR      END51           ;SKIP REST OF TEST
2325
2326  010632  022767  000103  167740  ISA51:  CMP     #103,   $PSW    ;CHECK PS AFTER FIS TRAP
2327  010640  001401                           BEQ     .+4             ;BRANCH IF OK
2328  010642  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 103
2329
2330  010644  022767  010574  167732           CMP     #RTA51, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2331  010652  001401                           BEQ     .+4             ;BRANCH IF OK
2332  010654  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2333
2334  010656  022767  000242  167722           CMP     #242,   ANS2    ;CHECK PS BEFORE FIS TRAP
2335  010664  001401                           BEQ     .+4             ;BRANCH IF OK
2336  010666  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 242
2337
2338  010670  022767  014377  167712           CMP     #014377,ANS3    ;CHECK DATA FROM THE STACK
2339  010676  001401                           BEQ     .+4             ;BRANCH IF OK
2340  010700  104004                           HLT+4                   ;DATA ON STACK (014377) CHANGED
2341
2342  010702  022767  177777  167702           CMP     #177777,ANS4    ;CHECK DATA FROM STACK
2343  010710  001401                           BEQ     .+4             ;BRANCH IF OK
2344  010712  104004                           HLT+4                   ;DATA ON STACK (177777) CHANGED
2345
2346  010714  022767  154200  167672           CMP     #154200,ANS5    ;CHECK DATA FROM STACK
2347  010722  001401                           BEQ     .+4             ;BRANCH IF OK
2348  010724  104006                           HLT+6                   ;DATA ON STACK (154200) CHANGED
2349
2350  010726  005767  167664                   TST     ANS6            ;CHECK DATA FROM STACK
2351  010732  001401                           BEQ     .+4             ;BRANCH IF OK
2352  010734  104006                           HLT+6                   ;DATA ON STACK (000000) CHANGED
2353
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2354  010736  122767  000051  170034  END51:  CMPB    #51,    ICNT    ;CHECK THE TEST NUMBER
2355  010744  001401                          BEQ     .+4             ;BRANCH IF OK
2356  010746  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2357
2358  010750  104400                          SCOPE
2359
2360
2361                                  ;*************************************************************************
2362                                  ;TEST 52:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2363                                  ;       125252,125252 / 065252,125252 = 100200,000000
2364                                  ;       PS = 210,       STACK POINTER = R2
2365                                  ;*************************************************************************
2366
2367  010752  004567  005332          TST52:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R2 STACK, SET PRIORITY
2368  010756  065252  125252                  .WORD   065252,125252   ;SECOND OPERAND ON TOP
2369  010762  125252  125252                  .WORD   125252,125252   ;FIRST OPERAND ON BOTTOM
2370  010766  000217                          .WORD   217             ;PROCESSOR PRIORITY LEVEL
2371  010770  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
2372  010774  012702  000630                  MOV     #STACK0,R2      ;SET UP STACK POINTER
2373
2374  011000  000240                          NOP
2375  011002  075032                          FDIV+   R2              ;FLOATING DIVIDE ON THE R2 STACK
2376
2377  011004  004767  005332                  JSR     PC,     POPR    ;POP THE ANSWER
2378  011010  010267  167566                  MOV     R2,     $SP     ;SAVE "STACK POINTER"
2379  011014  022767  000210  167556          CMP     #210,   $PSW    ;CHECK PS (EXCEPT T BIT)
2380  011022  001401                          BEQ     .+4             ;BRANCH IF OK
2381  011024  104000                          HLT                     ;PS NOT EQUAL TO 210
2382
2383  011026  022767  000634  167546          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R2)
2384  011034  001401                          BEQ     .+4             ;BRANCH IF OK
2385  011036  104000                          HLT                     ;STACK POINTER (R2) NOT EQUAL TO #STACK4
2386
2387  011040  022767  100200  167536          CMP     #100200,ANS1    ;CHECK FIRST HALF OF ANSWER
2388  011046  001401                          BEQ     .+4             ;BRANCH IF OK
2389  011050  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 100200
2390
2391  011052  005767  167530                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
2392  011056  001401                          BEQ     .+4             ;BRANCH IF OK
2393  011060  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000
2394
2395  011062  122767  000052  167710  END52:  CMPB    #52,    ICNT    ;CHECK THE TEST NUMBER
2396  011070  001401                          BEQ     .+4             ;BRANCH IF OK
2397  011072  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2398
2399  011074  104400                          SCOPE
2400
```

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2401
2402                                    ;*************************************************************************
2403                                    ;TEST 53:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2404                                    ;       025252,125251 / 065252,125252 ==> UNDERFLOW
2405                                    ;       PS(ON STACK) = 012,     STACK POINTER = R1
2406                                    ;*************************************************************************
2407
2408  011076  004567  005206           TST53:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
2409  011102  065252  125252                   .WORD   065252,125252   ;SECOND OPERAND ON TOP
2410  011106  025252  125251                   .WORD   025252,125251   ;FIRST OPERAND ON BOTTOM
2411  011112  000015                           .WORD   015             ;PROCESSOR PRIORITY LEVEL
2412  011114  011144  000300                   .WORD   ISR53,  300     ;FIS TRAP VECTOR
2413  011120  012701  000630                   MOV     #STACK0,R1      ;SET UP R1 AS STACK POINTER
2414
2415  011124  000240                           NOP
2416  011126  075031                           FDIV+   R1              ;FLOATING DIVIDE ON THE R1 STACK
2417
2418  011130  004767  005206           RTA53:  JSR     %7,     POPR    ;POP THE "ANSWER"
2419  011134  010167  167442                   MOV     R1,     $SP     ;SAVE STACK POINTER (R1)
2420  011140  104002                           HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2421  011142  000454                           BR      END53
2422
2423  011144  004767  005224           ISR53:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
2424  011150  010167  167426                   MOV     R1,     $SP     ;SAVE STACK POINTER (R1)
2425  011154  022767  000300  167416           CMP     #300,   $PSW    ;CHECK PS AFTER FIS TRAP
2426  011162  001401                           BEQ     .+4             ;BRANCH IF OK
2427  011164  104000                           HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 300
2428
2429  011166  022767  000630  167406           CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R1)
2430  011174  001401                           BEQ     .+4             ;BRANCH IF OK
2431  011176  104000                           HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK0
2432
2433  011200  022767  011130  167376           CMP     #RTA53, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2434  011206  001401                           BEQ     .+4             ;BRANCH IF OK
2435  011210  104001                           HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2436
2437  011212  022767  000012  167366           CMP     #012,   ANS2    ;CHECK PS BEFORE FIS TRAP
2438  011220  001401                           BEQ     .+4             ;BRANCH IF OK
2439  011222  104002                           HLT+2                   ;PS AT FIS TRAP TIME NOT 012
2440
2441  011224  022767  065252  167356           CMP     #065252,ANS3    ;CHECK DATA FROM THE STACK
2442  011232  001401                           BEQ     .+4             ;BRANCH IF OK
2443  011234  104004                           HLT+4                   ;DATA ON STACK (065252) CHANGED
2444
2445  011236  022767  125252  167346           CMP     #125252,ANS4    ;CHECK DATA FROM STACK
2446  011244  001401                           BEQ     .+4             ;BRANCH IF OK
2447  011246  104004                           HLT+4                   ;DATA ON STACK (125252) CHANGED
2448
2449  011250  022767  025252  167336           CMP     #025252,ANS5    ;CHECK DATA FROM STACK
2450  011256  001401                           BEQ     .+4             ;BRANCH IF OK
2451  011260  104006                           HLT+6                   ;DATA ON STACK (025252) CHANGED
2452
2453  011262  022767  125251  167326           CMP     #125251,ANS6    ;CHECK DATA FROM STACK
2454  011270  001401                           BEQ     .+4             ;BRANCH IF OK
2455  011272  104006                           HLT+6                   ;DATA ON STACK (125251) CHANGED
2456
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2457  011274  122767  000053  167476  END53:  CMPB    #53,    ICNT    ;CHECK THE TEST NUMBER
2458  011302  001401                          BEQ     .+4             ;BRANCH IF OK
2459  011304  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2460
2461  011306  104400                          SCOPE
2462
2463
2464                                  ;*************************************************************************
2465                                  ;TEST 54:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2466                                  ;       000000,000000 / 140670,123456 = 000000,000000
2467                                  ;       PS = 104,       STACK POINTER = R3
2468                                  ;*************************************************************************
2469
2470  011310  004567  004774          TST54:  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R3 STACK, SET PRIORITY
2471  011314  140670  123456                  .WORD   140670,123456   ;SECOND OPERAND ON TOP
2472  011320  000000  000000                  .WORD   000000,000000   ;FIRST OPERAND ON BOTTOM
2473  011324  000105                          .WORD   105             ;PROCESSOR PRIORITY LEVEL
2474  011326  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
2475  011332  012703  000630                  MOV     #STACK0,R3      ;SET UP STACK POINTER
2476
2477  011336  000240                          NOP
2478  011340  075033                          FDIV+   R3              ;FLOATING DIVIDE ON THE R3 STACK
2479
2480  011342  004767  004774                  JSR     PC,     POPR    ;POP THE ANSWER
2481  011346  010367  167230                  MOV     R3,     $SP     ;SAVE "STACK POINTER"
2482  011352  022767  000104  167220          CMP     #104,   $PSW    ;CHECK PS (EXCEPT T BIT)
2483  011360  001401                          BEQ     .+4             ;BRANCH IF OK
2484  011362  104000                          HLT                     ;PS NOT EQUAL TO 104
2485
2486  011364  022767  000634  167210          CMP     #STACK4,$SP     ;CHECK THE STACK POINTER (R3)
2487  011372  001401                          BEQ     .+4             ;BRANCH IF OK
2488  011374  104000                          HLT                     ;STACK POINTER (R3) NOT EQUAL TO #STACK4
2489
2490  011376  005767  167202                  TST     ANS1            ;CHECK FIRST HALF OF ANSWER
2491  011402  001401                          BEQ     .+4             ;BRANCH IF OK
2492  011404  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 000000
2493
2494  011406  005767  167174                  TST     ANS2            ;CHECK SECOND HALF OF ANSWER
2495  011412  001401                          BEQ     .+4             ;BRANCH IF OK
2496  011414  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 000000
2497
2498  011416  122767  000054  167354  END54:  CMPB    #54,    ICNT    ;CHECK THE TEST NUMBER
2499  011424  001401                          BEQ     .+4             ;BRANCH IF OK
2500  011426  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2501
2502  011430  104400                          SCOPE
2503
```

```
2504
2505                                    ;*************************************************************************
2506                                    ;TEST 55:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2507                                    ;       100052,052525 / 000006,123456 ==> DIVIDE BY ZERO
2508                                    ;       PS(ON STACK) = 353,     STACK POINTER = SP
2509                                    ;*************************************************************************
2510
2511  011432  004567  004474       TST55:  JSR     R5,     PUSHS   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2512  011436  000006  123456               .WORD   000006,123456   ;SECOND OPERAND ON TOP
2513  011442  100052  052525               .WORD   100052,052525   ;FIRST OPERAND ON BOTTOM
2514  011446  000357                       .WORD   357             ;PROCESSOR PRIORITY LEVEL
2515  011450  011474  000311               .WORD   ISR55,  311     ;FIS TRAP VECTOR
2516
2517  011454  000240                       NOP
2518  011456  075036                       FDIV+   SP              ;FLOATING DIVIDE ON THE STACK
2519
2520  011460  004767  004506       RTA55:  JSR     %7,     POPS    ;POP THE "ANSWER"
2521  011464  104002                       HLT+2                   ;FIS TRAP DIDN'T OCCURE!
2522  011466  012706  000500               MOV     #500,   SP      ;RESTORE THE STACK POINTER
2523  011472  000454                       BR      END55
2524
2525  011474  004767  004526       ISR55:  JSR     %7,     POPES   ;POP ALL DATA OFF THE STACK
2526  011500  022706  000500               CMP     #500,   SP      ;CHECK THE STACK POINTER
2527  011504  001404                       BEQ     ISA55           ;BRANCH IF OK
2528  011506  012706  000500               MOV     #500,   SP      ;RESTORE THE STACK POINTER
2529  011512  104000                       HLT                     ;STACK POINTER FOULED UP
2530  011514  000443                       BR      END55           ;SKIP REST OF TEST
2531
2532  011516  022767  000311  167054 ISA55:  CMP     #311,   $PSW    ;CHECK PS AFTER FIS TRAP
2533  011524  001401                       BEQ     .+4             ;BRANCH IF OK
2534  011526  104000                       HLT                     ;PS AFTER FIS TRAP NOT EQUAL TO 311
2535
2536  011530  022767  011460  167046         CMP     #RTA55, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
2537  011536  001401                       BEQ     .+4             ;BRANCH IF OK
2538  011540  104001                       HLT+1                   ;FIS TRAP AT WRONG ADDRESS
2539
2540  011542  022767  000353  167036         CMP     #353,   ANS2    ;CHECK PS BEFORE FIS TRAP
2541  011550  001401                       BEQ     .+4             ;BRANCH IF OK
2542  011552  104002                       HLT+2                   ;PS AT FIS TRAP TIME NOT 353
2543
2544  011554  022767  000006  167026         CMP     #000006,ANS3    ;CHECK DATA FROM THE STACK
2545  011562  001401                       BEQ     .+4             ;BRANCH IF OK
2546  011564  104004                       HLT+4                   ;DATA ON STACK (000006) CHANGED
2547
2548  011566  022767  123456  167016         CMP     #123456,ANS4    ;CHECK DATA FROM STACK
2549  011574  001401                       BEQ     .+4             ;BRANCH IF OK
2550  011576  104004                       HLT+4                   ;DATA ON STACK (123456) CHANGED
2551
2552  011600  022767  100052  167006         CMP     #100052,ANS5    ;CHECK DATA FROM STACK
2553  011606  001401                       BEQ     .+4             ;BRANCH IF OK
2554  011610  104006                       HLT+6                   ;DATA ON STACK (100052) CHANGED
2555
2556  011612  022767  052525  166776         CMP     #052525,ANS6    ;CHECK DATA FROM STACK
2557  011620  001401                       BEQ     .+4             ;BRANCH IF OK
2558  011622  104006                       HLT+6                   ;DATA ON STACK (052525) CHANGED
2559
```

```
2560  011624  122767  000055  167146  END55:  CMPB    #55,    ICNT    ;CHECK THE TEST NUMBER
2561  011632  001401                          BEQ     .+4             ;BRANCH IF OK
2562  011634  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2563
2564  011636  104400                          SCOPE
2565
2566
2567                                  ;*************************************************************************
2568                                  ;TEST 56:       FADD (KE11F FLOATING ADD INSTRUCTION)
2569                                  ;       004000,105004 + 104000,104000 = 000401,000000
2570                                  ;       PS = 140,       STACK POINTER = PC
2571                                  ;*************************************************************************
2572
2573  011640  004567  004622          TST56:  JSR     R5,     PUSH7   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2574  011644  011670                          .WORD   STK56           ;TOP OF STACK
2575  011646  104000  104000                  .WORD   104000,104000   ;SECOND OPERAND ON TOP
2576  011652  004000  105004                  .WORD   004000,105004   ;FIRST OPERAND ON BOTTOM
2577  011656  000144                          .WORD   144             ;PROCESSOR PRIORITY LEVEL
2578  011660  016574  000340                  .WORD   TRAPER,340      ;FIS TRAP VECTOR
2579
2580  011664  000240                          NOP
2581  011666  075007                          FADD+   PC              ;FLOATING ADD ON FOLLOWING 4 WORDS
2582  011670  104000                  STK56:  104000                  ;SHOULD CONTAIN 104000
2583  011672  104000                          104000                  ;SHOULD CONTAIN 104000
2584  011674  004000                          004000                  ;BEFORE FADD, 004000; AFTER, 000401
2585  011676  105004                          105004                  ;BEFORE FADD, 105004; AFTER, 000000
2586
2587  011700  004767  004620                  JSR     PC,     POP7    ;POP THE ANSWER
2588  011704  022767  000140  166666          CMP     #140,   $PSW    ;CHECK PS (EXCEPT T BIT)
2589  011712  001401                          BEQ     .+4             ;BRANCH IF OK
2590  011714  104000                          HLT                     ;PS NOT EQUAL TO 140
2591
2592  011716  022767  104000  166660          CMP     #104000,ANS1    ;CHECK FIRST HALF OF INPUT DATA (STK56)
2593  011724  001401                          BEQ     .+4             ;BRANCH IF OK
2594  011726  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 104000
2595
2596  011730  022767  104000  166650          CMP     #104000,ANS2    ;CHECK SECOND HALF OF INPUT DATA (STK56+2)
2597  011736  001401                          BEQ     .+4             ;BRANCH IF OK
2598  011740  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 104000
2599
2600  011742  022767  000401  166640          CMP     #000401,ANS3    ;CHECK FIRST HALF OF ANSWER
2601  011750  001401                          BEQ     .+4             ;BRANCH IF OK
2602  011752  104004                          HLT+4                   ;ANS3 NOT EQUAL TO 000401
2603
2604  011754  005767  166632                  TST     ANS4            ;CHECK SECOND HALF OF ANSWER
2605  011760  001401                          BEQ     .+4             ;BRANCH IF OK
2606  011762  104004                          HLT+4                   ;ANS4 NOT EQUAL TO 000000
2607
2608  011764  122767  000056  167006  END56:  CMPB    #56,    ICNT    ;CHECK THE TEST NUMBER
2609  011772  001401                          BEQ     .+4             ;BRANCH IF OK
2610  011774  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2611
2612  011776  104400                          SCOPE
2613
2614
2615                                  ;*************************************************************************
```

```
                                        ;TEST 57:       FSUB (KE11F FLOATING SUBTRACT INSTRUCTION)
                                        ;       104000,105004 - 104000,104000 = 100401,000000
                                        ;       PS = 250,       STACK POINTER = PC
                                        ;*************************************************************************
012000  004567  004462        TST57:  JSR     R5,     PUSH7   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
012004  012030                        .WORD   STK57           ;TOP OF STACK
012006  104000  104000                .WORD   104000,104000   ;SECOND OPERAND ON TOP
012012  104000  105004                .WORD   104000,105004   ;FIRST OPERAND ON BOTTOM
012016  000252                        .WORD   252             ;PROCESSOR PRIORITY LEVEL
012020  016574  000340                .WORD   TRAPER,340      ;FIS TRAP VECTOR

012024  000240                        NOP
012026  075C17                        FSUB+   PC              ;FLOATING SUBTRACT ON FOLLOWING 4 WORDS
012030  104000                STK57:  104000                  ;SHOULD CONTAIN 104000
012032  104000                        104000                  ;SHOULD CONTAIN 104000
012034  104000                        104000                  ;BEFORE FSUB, 104000; AFTER, 100401
012036  105004                        105004                  ;BEFORE FSUB, 105004; AFTER, 000000

012040  004767  004460                JSR     PC,     POP7    ;POP THE ANSWER
012044  022767  000250  166526        CMP     #250,   $PSW    ;CHECK PS (EXCEPT T BIT)
012052  001401                        BEQ     .+4             ;BRANCH IF OK
012054  104000                        HLT                     ;PS NOT EQUAL TO 250

012056  022767  104000  166520        CMP     #104000,ANS1    ;CHECK FIRST HALF OF INPUT DATA (STK57)
012064  001401                        BEQ     .+4             ;BRANCH IF OK
012066  104002                        HLT+2                   ;ANS1 NOT EQUAL TO 104000

012070  022767  104000  166510        CMP     #104000,ANS2    ;CHECK SECOND HALF OF INPUT DATA (STK57+2)
012076  001401                        BEQ     .+4             ;BRANCH IF OK
012100  104002                        HLT+2                   ;ANS2 NOT EQUAL TO 104000

012102  022767  100401  166500        CMP     #100401,ANS3    ;CHECK FIRST HALF OF ANSWER
012110  001401                        BEQ     .+4             ;BRANCH IF OK
012112  104004                        HLT+4                   ;ANS3 NOT EQUAL TO 100401

012114  005767  166472                TST     ANS4            ;CHECK SECOND HALF OF ANSWER
012120  001401                        BEQ     .+4             ;BRANCH IF OK
012122  104004                        HLT+4                   ;ANS4 NOT EQUAL TO 000000

012124  122767  000057  166646  END57:  CMPB    #57.    ICNT    ;CHECK THE TEST NUMBER
012132  001401                        BEQ     .+4             ;BRANCH IF OK
012134  104000                        HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

012136  104400                        SCOPE
```

```
2662
2663                                    ;*************************************************************************
2664                                    ;TEST 60:       FMUL (KE11F FLOATING MULTIPLY INSTRUCTION)
2665                                    ;       134600,073601 * 104000,104000 = 000401,000000
2666                                    ;       PS = 240,       STACK POINTER = PC
2667                                    ;*************************************************************************
2668
2669  012140  004567  004322           TST60:  JSR     R5,     PUSH7   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2670  012144  012170                           .WORD   STK60           ;TOP OF STACK
2671  012146  104000  104000                   .WORD   104000,104000   ;SECOND OPERAND ON TOP
2672  012152  134600  073601                   .WORD   134600,073601   ;FIRST OPERAND ON BOTTOM
2673  012156  000246                           .WORD   246             ;PROCESSOR PRIORITY LEVEL
2674  012160  016574  000340                   .WORD   TRAPER,340      ;FIS TRAP VECTOR
2675
2676  012164  000240                           NOP
2677  012166  075027                           FMUL+   PC              ;FLOATING MULTIPLY ON FOLLOWING 4 WORDS
2678  012170  104000                   STK60:  104000                  ;SHOULD CONTAIN 104000
2679  012172  104000                           104000                  ;SHOULD CONTAIN 104000
2680  012174  134600                           134600                  ;BEFORE FMUL, 134600; AFTER, 000401
2681  012176  073601                           073601                  ;BEFORE FMUL, 073601; AFTER, 000000
2682
2683  012200  004767  004320                   JSR     PC,     POP7    ;POP THE ANSWER
2684  012204  022767  000240  166366           CMP     #240,   $PSW    ;CHECK PS (EXCEPT T BIT)
2685  012212  001401                           BEQ     .+4             ;BRANCH IF OK
2686  012214  104000                           HLT                     ;PS NOT EQUAL TO 240
2687
2688  012216  022767  104000  166360           CMP     #104000,ANS1    ;CHECK FIRST HALF OF INPUT DATA (STK60)
2689  012224  001401                           BEQ     .+4             ;BRANCH IF OK
2690  012226  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 104000
2691
2692  012230  022767  104000  166350           CMP     #104000,ANS2    ;CHECK SECOND HALF OF INPUT DATA (STK60+2)
2693  012236  001401                           BEQ     .+4             ;BRANCH IF OK
2694  012240  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 104000
2695
2696  012242  022767  000401  166340           CMP     #000401,ANS3    ;CHECK FIRST HALF OF ANSWER
2697  012250  001401                           BEQ     .+4             ;BRANCH IF OK
2698  012252  104004                           HLT+4                   ;ANS3 NOT EQUAL TO 000401
2699
2700  012254  005767  166332                   TST     ANS4            ;CHECK SECOND HALF OF ANSWER
2701  012260  001401                           BEQ     .+4             ;BRANCH IF OK
2702  012262  104004                           HLT+4                   ;ANS4 NOT EQUAL TO 000000
2703
2704  012264  122767  000060  166506  END60:  CMPB    #60,    ICNT    ;CHECK THE TEST NUMBER
2705  012272  001401                           BEQ     .+4             ;BRANCH IF OK
2706  012274  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2707
270   012276  104400                           SCOPE
2709
```

```
2710
2711                                    ;*****************************************************************
2712                                    ;TEST 61:       FDIV (KE11F FLOATING DIVIDE INSTRUCTION)
2713                                    ;       102500,146000 / 104000,104000 = 036700,000000
2714                                    ;       PS = 340,       STACK POINTER = PC
2715                                    ;*****************************************************************
2716
2717  012300  004567  004162           TST61:  JSR     R5,     PUSH7   ;PUSH 4 WORDS ONTO STACK, SET PRIORITY
2718  012304  012330                           .WORD   STK61           ;TOP OF STACK
2719  012306  104000  104000                   .WORD   104000,104000   ;SECOND OPERAND ON TOP
2720  012312  102500  146000                   .WORD   102500,146000   ;FIRST OPERAND ON BOTTOM
2721  012316  000357                           .WORD   357             ;PROCESSOR PRIORITY LEVEL
2722  012320  016574  000340                   .WORD   TRAPER,340      ;FIS TRAP VECTOR
2723
2724  012324  000240                           NOP
2725  012326  075037                           FDIV+   PC              ;FLOATING DIVIDE ON FOLLOWING 4 WORDS
2726  012330  104000                   STK61:  104000                  ;SHOULD CONTAIN 104000
2727  012332  104000                           104000                  ;SHOULD CONTAIN 104000
2728  012334  102500                           102500                  ;BEFORE FDIV, 102500; AFTER, 036700
2729  012336  146000                           146000                  ;BEFORE FDIV, 146000; AFTER, 000000
2730
2731  012340  004767  004160                   JSR     PC,     POP7    ;POP THE ANSWER
2732  012344  022767  000340  166226           CMP     #340,   $PSW    ;CHECK PS (EXCEPT T BIT)
2733  012352  001401                           BEQ     .+4             ;BRANCH IF OK
2734  012354  104000                           HLT                     ;PS NOT EQUAL TO 340
2735
2736  012356  022767  104000  166220           CMP     #104000,ANS1    ;CHECK FIRST HALF OF INPUT DATA (STK61)
2737  012364  001401                           BEQ     .+4             ;BRANCH IF OK
2738  012366  104002                           HLT+2                   ;ANS1 NOT EQUAL TO 104000
2739
2740  012370  022767  104000  166210           CMP     #104000,ANS2    ;CHECK SECOND HALF OF INPUT DATA (STK61+2)
2741  012376  001401                           BEQ     .+4             ;BRANCH IF OK
2742  012400  104002                           HLT+2                   ;ANS2 NOT EQUAL TO 104000
2743
2744  012402  022767  036700  166200           CMP     #036700,ANS3    ;CHECK FIRST HALF OF ANSWER
2745  012410  001401                           BEQ     .+4             ;BRANCH IF OK
2746  012412  104004                           HLT+4                   ;ANS3 NOT EQUAL TO 036700
2747
2748  012414  005767  166172                   TST     ANS4            ;CHECK SECCND HALF OF ANSWER
2749  012420  001401                           BEQ     .+4             ;BRANCH IF OK
2750  012422  104004                           HLT+4                   ;ANS4 NOT EQUAL TO 000000
2751
2752  012424  122767  000061  166346  END61:  CMPB    #61,    ICNT    ;CHECK THE TEST NUMBER
2753  012432  001401                           BEQ     .+4             ;BRANCH IF OK
2754  012434  104000                           HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2755
2756  012436  104400                           SCOPE
2757
```

```
                                ;*****************************************************************************
                                ;TEST 62:       TEST ALL INSTRUCTION TOGETHER
                                ;                                032107,065432 * 045670,123456
                                ;       134343,107070 + ------------------------------  = 137201,115230
                                ;                                (135252,125252 - 040616,016161)
                                ;       PS=150, STACK POINTER=R4
                                ;*****************************************************************************

012440  012704  000640          TST62:  MOV     #STACK8,R4      ;SET STACK POINTER
012444  012744  107070                  MOV     #107070,-(R4)   ;LOAD DATA ONTO STACK
012450  012744  134343                  MOV     #134343,-(R4)
012454  012744  065432                  MOV     #065432,-(R4)
012460  012744  032107                  MOV     #032107,-(R4)
012464  012744  123456                  MOV     #123456,-(R4)
012470  012744  045670                  MOV     #045670,-(R4)
012474  012744  125252                  MOV     #125252,-(R4)
012500  012744  135252                  MOV     #135252,-(R4)
012504  012744  016161                  MOV     #016161,-(R4)
012510  012744  040616                  MOV     #040616,-(R4)
012514  012737  000144  177776          MOV     #144,   @#PS    ;SET PROCESSOR STATUS

012522  000240                          NOP
012524  075014                          FSUB+   R4      ;135252,125252-040616,016161=140616,017434
012526  075034                          FDIV+   R4      ;045670,123456/140616,017434=145246,047065
012530  075024                          FMUL+   R4      ;032107,065432*145246,047065=137201,106137
012532  075004                          FADD+   R4      ;134343,107070+137201,106137=137201,115230

012534  013767  177776  166036          MOV     @#PS,   $PSW    ;SAVE FINAL PS
012542  042767  000020  166030          BIC     #20,    $PSW    ;CLR T-BIT
012550  012467  166030                  MOV     (R4)+,  ANS1    ;SAVE FIRST HALF OF ANSWER
012554  012467  166026                  MOV     (R4)+,  ANS2    ;SAVE SECOND HALF OF ANSWER
012560  010467  166016                  MOV     R4,     $SP     ;SAVE STACK POINTER
012564  022767  000150  166006          CMP     #150,   $PSW    ;CHECK PS (EXCEPT T BIT)
012572  001401                          BEQ     .+4             ;BRANCH IF OK
012574  104000                          HLT                     ;PS NOT EQUAL TO 150

012576  022767  000640  165776          CMP     #STACK8,$SP     ;CHECK THE STACK POINTER (R4)
012604  001401                          BEQ     .+4             ;BRANCH IF OK
012606  104000                          HLT                     ;STACK POINTER (R4) NOT EQUAL TO 674

012610  022767  137201  165766          CMP     #137201,ANS1    ;CHECK FIRST HALF OF ANSWER
012616  001401                          BEQ     .+4             ;BRANCH IF OK
012620  104002                          HLT+2                   ;ANS1 NOT EQUAL TO 137201

012622  022767  115230  165756          CMP     #115230,ANS2    ;CHECK SECOND HALF OF ANSWER
012630  001401                          BEQ     .+4             ;BRANCH IF OK
012632  104002                          HLT+2                   ;ANS2 NOT EQUAL TO 115230

012634  122767  000062  166136  END62:  CMPB    #62,    ICNT    ;CHECK THE TEST NUMBER
012642  001401                          BEQ     .+4             ;BRANCH IF OK
012644  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.

012646  104400                          SCOPE
```

```
2812
2813                                    ;*************************************************************************
2814                                    ;TEST 63:       TEST THAT YELLOW ZONE STACK OVERFLOW WORKS WITH FIS
2815                                    ;       STACK POINTER = SP = 356
2816                                    ;*************************************************************************
2817
2818  012650  012701  000356           TST63:  MOV     #356,   R1      ;SET UP STACK
2819  012654  012721  035152                   MOV     #035152,(R1)+   ;PUT DATA ON THE STACK
2820  012660  012721  125252                   MOV     #125252,(R1)+
2821  012664  012721  043125                   MOV     #043125,(R1)+
2822  012670  012721  052525                   MOV     #052525,(R1)+
2823  012674  012737  012760  000004           MOV     #3$,    @#4     ;SETUP STACK ERROR VECTOR
2824  012702  012737  000300  000006           MOV     #300,   @#6
2825  012710  013700  177776                   MOV     @#PS,   R0      ;SAVE THE T-BIT
2826  012714  012746  000340                   MOV     #340,   -(SP)   ;CLR T-BIT
2827  012720  012746  012726                   MOV     #1$,    -(SP)
2828  012724  000002                           RTI
2829  012726  012706  000356           1$:     MOV     #356,   SP      ;OVERFLOW THE STACK
2830
2831  012732  000240                           NOP
2832  012734  075006                           FADD+   SP              ;DO 043125 FLOATING POINT ADD
2833
2834  012736  016767  165034  165634   2$:     MOV     PS,     $PSW    ;SAVE PS FOR TYPING
2835  012744  010667  165632                   MOV     SP,     $SP     ;SAVE STACK POINTER
2836  012750  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK
2837  012754  104000                           HLT                     ;STACK OVERFLOW DIDN'T TRAP
2838
2839  012756  000454                           BR      4$
2840
2841  012760  016767  165012  165612   3$:     MOV     PS,     $PSW    ;SAVE THE PS
2842  012766  010667  165610                   MOV     SP,     $SP     ;SAVE THE STACK POINTER
2843  012772  010601                           MOV     SP,     R1
2844  012774  012706  000500                   MOV     #500,   SP      ;RESTORE THE STACK
2845  013000  012702  000604                   MOV     #ANS1,  R2      ;TOP OF ANSWER TABLE
2846  013004  012122                           MOV     (R1)+,  (R2)+   ;SAVE THE STACK DATA
2847  013006  012122                           MOV     (R1)+,  (R2)+
2848  013010  012122                           MOV     (R1)+,  (R2)+
2849  013012  012122                           MOV     (R1)+,  (R2)+
2850  013014  022767  000300  165556           CMP     #300,   $PSW    ;CHECK THE PS AFTER THE TRAP
2851  013022  001401                           BEQ     .+4             ;BRANCH IF OK
2852  013024  104000                           HLT                     ;PS NOT EQUAL TO 300
2853
2854  013026  022767  000356  165546           CMP     #356,   $SP     ;CHECK FOR SP AT RIGHT SPOT
2855  013034  001401                           BEQ     .+4             ;BRANCH IF OK
2856  013036  104000                           HLT                     ;STACK POINTER FOULED UP
2857
2858  013040  022767  012736  165536           CMP     #2$,    ANS1    ;CHECK TOP OF STACK FOR RTI ADR.
2859  013046  001401                           BEQ     .+4             ;BRANCH IF OK
2860  013050  104001                           HLT+1                   ;RTI ADDRESS NOT EQUAL TO #2$
2861
2862  013052  022767  000340  165526           CMP     #340,   ANS2    ;CHECK STACK DATA FOR RTI PS
2863  013060  001401                           BEQ     .+4             ;BRANCH IF OK
2864  013062  104002                           HLT+2                   ;RTI PS NOT EQUAL TO 340
2865
2866  013064  022767  043125  165516           CMP     #043125,ANS3    ;CHECK FIRST HALF OF ANSWER
2867  013072  001401                           BEQ     .+4             ;BRANCH IF OK
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2868  013074  104004                          HLT+4                   ;ANS3 NOT EQUAL TO 043125
2869
2870  013076  022767  052526  165506          CMP     #052526,ANS4    ;CHECK SECOND HALF OF ANSWER
2871  013104  001401                          BEQ     .+4             ;BRANCH IF OK
2872  013106  104004                          HLT+4                   ;ANS4 NOT EQUAL TO 052526
2873
2874  013110  010046                  4$:     MOV     R0,     -(SP)   ;RESTORE THE T-BIT
2875  013112  012746  013120                  MOV     #5$,    -(SP)
2876  013116  000002                          RTI
2877  013120  122767  000063  165652  5$:     CMPB    #63,    ICNT    ;CHECK THE TEST NUMBER
2878  013126  001401                          BEQ     .+4             ;BRANCH IF OK
2879  013130  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2880
2881  013132  104400                          SCOPE
2882
2883
2884                                  ;*************************************************************************
2885                                  ;TEST 64:       TEST THAT RED ZONE STACK OVERFLOW WORKS WITH FIS
2886                                  ;       STACK POINTER = SP = 0
2887                                  ;*************************************************************************
2888
2889  013134  012701  000332          TST64:  MOV     #332,   R1      ;SET UP STACK
2890  013140  012721  025177                  MOV     #025177,(R1)+   ;PUT DATA ON THE STACK
2891  013144  012721  177777                  MOV     #177777,(R1)+
2892  013150  012721  125200                  MOV     #125200,(R1)+
2893  013154  012721  000000                  MOV     #000000,(R1)+
2894  013160  012737  013244  000004          MOV     #3$,    @#4     ;SETUP STACK ERROR VECTOR
2895  013166  012737  000300  000006          MOV     #300,   @#6
2896  013174  013700  177776                  MOV     @#PS,   R0      ;SAVE THE T-BIT
2897  013200  012746  000340                  MOV     #340,   -(SP)   ;CLR T-BIT
2898  013204  012746  013212                  MOV     #1$,    -(SP)
2899  013210  000002                          RTI
2900  013212  012706  000332          1$:     MOV     #332,   SP      ;OVERFLOW THE STACK
2901
2902  013216  000240                          NOP
2903  013220  075006                          FADD+   SP              ;DO 125200 FLOATING POINT ADD
2904
2905  013222  016767  164550  165350  2$:     MOV     PS,     $PSW    ;SAVE PS FOR TYPING
2906  013230  010667  165346                  MOV     SP,     $SP     ;SAVE STACK POINTER
2907  013234  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK
2908  013240  104000                          HLT                     ;STACK OVERFLOW DIDN'T TRAP
2909
2910  013242  000473                          BR      4$
2911
2912  013244  016767  164526  165326  3$:     MOV     PS,     $PSW    ;SAVE THE PS
2913  013252  010667  165324                  MOV     SP,     $SP     ;SAVE THE STACK POINTER
2914  013256  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK
2915  013262  013767  000000  165314          MOV     @#0,    ANS1    ;SAVE RETURN ADR
2916  013270  013767  000002  165310          MOV     @#2,    ANS2    ;SAVE RETURN STATUS
2917  013276  012701  000332                  MOV     #332,   R1      ;POINT TO TOP OF ORIGINAL STACK
2918  013302  012702  000610                  MOV     #ANS3,  R2      ;TOP OF ANSWER TABLE
2919  013306  012122                          MOV     (R1)+,  (R2)+   ;SAVE THE STACK DATA
2920  013310  012122                          MOV     (R1)+,  (R2)+
2921  013312  012122                          MOV     (R1)+,  (R2)+
2922  013314  012122                          MOV     (R1)+,  (R2)+
2923  013316  022767  000300  165254          CMP     #300,   $PSW    ;CHECK THE PS AFTER THE TRAP
```

```
2924  013324  001401                          BEQ     .+4             ;BRANCH IF OK
2925  013326  104000                          HLT                     ;PS NOT EQUAL TO 300
2926
2927  013330  005767  165246                  TST     $SP             ;CHECK FOR SP AT RIGHT SPOT
2928  013334  001401                          BEQ     .+4             ;BRANCH IF OK
2929  013336  104000                          HLT                     ;STACK POINTER FOULED UP
2930
2931  013340  022767  013222  165236          CMP     #2$,    ANS1    ;CHECK TOP OF STACK FOR RTI ADR.
2932  013346  001401                          BEQ     .+4             ;BRANCH IF OK
2933  013350  104001                          HLT+1                   ;RTI ADDRESS NOT EQUAL TO #2$
2934
2935  013352  022767  000340  165226          CMP     #340,   ANS2    ;CHECK STACK DATA FOR RTI PS
2936  013360  001401                          BEQ     .+4             ;BRANCH IF OK
2937  013362  104002                          HLT+2                   ;RTI PS NOT EQUAL TO 340
2938
2939  013364  022767  025177  165216          CMP     #025177,ANS3    ;CHECK DATA FROM THE STACK
2940  013372  001401                          BEQ     .+4             ;BRANCH IF OK
2941  013374  104004                          HLT+4                   ;DATA ON STACK (025177) CHANGED
2942
2943  013376  022767  177777  165206          CMP     #177777,ANS4    ;CHECK DATA FROM THE STACK
2944  013404  001401                          BEQ     .+4             ;BRANCH IF OK
2945  013406  104004                          HLT+4                   ;DATA ON STACK (177777) CHANGED
2946
2947  013410  022767  125200  165176          CMP     #125200,ANS5    ;CHECK DATA FROM THE STACK
2948  013416  001401                          BEQ     .+4             ;BRANCH IF OK
2949  013420  104004                          HLT+4                   ;DATA ON STACK (125200) CHANGED
2950
2951  013422  005767  165170                  TST     ANS6            ;CHECK DATA FROM THE STACK
2952  013426  001401                          BEQ     .+4             ;BRANCH IF OK
2953  013430  104004                          HLT+4                   ;DATA ON STACK (000000) CHANGED
2954
2955  013432  010046                  4$:     MOV     R0,     -(SP)   ;RESTORE THE T-BIT
2956  013434  012746  013442                  MOV     #5$,    -(SP)
2957  013440  000002                          RTI
2958  013442  122767  000064  165330  5$:     CMPB    #64,    ICNT    ;CHECK THE TEST NUMBER
2959  013450  001401                          BEQ     .+4             ;BRANCH IF OK
2960  013452  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
2961
2962  013454  104400                          SCOPE
2963
```

```
2964
2965                                    ;*************************************************************************
2966                                    ;TEST 65:       TEST THAT RED ZONE STACK OVERFLOW WORKS WITH FIS
2967                                    ;       STACK POINTER = SP = 0
2968                                    ;*************************************************************************
2969
2970  013456  012701  000326          TST65:  MOV     #326,   R1      ;SET UP STACK
2971  013462  012721  100125                  MOV     #100125,(R1)+   ;PUT DATA ON THE STACK
2972  013466  012721  052525                  MOV     #052525,(R1)+
2973  013472  012721  135753                  MOV     #135753,(R1)+
2974  013476  012721  024642                  MOV     #024642,(R1)+
2975  013502  012737  013566  000004          MOV     #3$,    @#4     ;SETUP STACK ERROR VECTOR
2976  013510  012737  000300  000006          MOV     #300,   @#6
2977  013516  013700  177776                  MOV     @#PS,   R0      ;SAVE THE T-BIT
2978  013522  012746  000340                  MOV     #340,   -(SP)   ;CLR T-BIT
2979  013526  012746  013534                  MOV     #1$,    -(SP)
2980  013532  000002                          RTI
2981  013534  012706  000326          1$:     MOV     #326,   SP      ;OVERFLOW THE STACK
2982
2983  013540  000240                          NOP
2984  013542  075006                          FADD+   SP              ;DO 135753 FLOATING POINT ADD
2985
2986  013544  016767  164226  165026  2$:     MOV     PS,     $PSW    ;SAVE PS FOR TYPING
2987  013552  010667  165024                  MOV     SP,     $SP     ;SAVE STACK POINTER
2988  013556  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK
2989  013562  104000                          HLT                     ;STACK OVERFLOW DIDN'T TRAP
2990
2991  013564  000474                          BR      4$
2992
2993  013566  016767  164204  165004  3$:     MOV     PS,     $PSW    ;SAVE THE PS
2994  013574  010667  165002                  MOV     SP,     $SP     ;SAVE THE STACK POINTER
2995  013600  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK
2996  013604  013767  000000  164772          MOV     @#0,    ANS1    ;SAVE RETURN ADR
2997  013612  013767  000002  164766          MOV     @#2,    ANS2    ;SAVE RETURN STATUS
2998  013620  012701  000326                  MOV     #326,   R1      ;POINT TO TOP OF ORIGINAL STACK
2999  013624  012702  000610                  MOV     #ANS3,  R2      ;TOP OF ANSWER TABLE
3000  013630  012122                          MOV     (R1)+,  (R2)+   ;SAVE THE STACK DATA
3001  013632  012122                          MOV     (R1)+,  (R2)+
3002  013634  012122                          MOV     (R1)+,  (R2)+
3003  013636  012122                          MOV     (R1)+,  (R2)+
3004  013640  022767  000300  164732          CMP     #300,   $PSW    ;CHECK THE PS AFTER THE TRAP
3005  013646  001401                          BEQ     .+4             ;BRANCH IF OK
3006  013650  104000                          HLT                     ;PS NOT EQUAL TO 300
3007
3008  013652  005767  164724                  TST     $SP             ;CHECK FOR SP AT RIGHT SPOT
3009  013656  001401                          BEQ     .+4             ;BRANCH IF OK
3010  013660  104000                          HLT                     ;STACK POINTER FOULED UP
3011
3012  013662  022767  013544  164714          CMP     #2$,    ANS1    ;CHECK TOP OF STACK FOR RTI ADR.
3013  013670  001401                          BEQ     .+4             ;BRANCH IF OK
3014  013672  104001                          HLT+1                   ;RTI ADDRESS NOT EQUAL TO #2$
3015
3016  013674  022767  000340  164704          CMP     #340,   ANS2    ;CHECK STACK DATA FOR RTI PS
3017  013702  001401                          BEQ     .+4             ;BRANCH IF OK
3018  013704  104002                          HLT+2                   ;RTI PS NOT EQUAL TO 340
3019
```

```
3020  013706  022767  100125  164674          CMP     #100125,ANS3    ;CHECK DATA FROM THE STACK
3021  013714  001401                          BEQ     .+4             ;BRANCH IF OK
3022  013716  104004                          HLT+4                   ;DATA ON STACK (100125) CHANGED
3023
3024  013720  022767  052525  164664          CMP     #052525,ANS4    ;CHECK DATA FROM THE STACK
3025  013726  001401                          BEQ     .+4             ;BRANCH IF OK
3026  013730  104004                          HLT+4                   ;DATA ON STACK (052525) CHANGED
3027
3028  013732  022767  135753  164654          CMP     #135753,ANS5    ;CHECK DATA FROM THE STACK
3029  013740  001401                          BEQ     .+4             ;BRANCH IF OK
3030  013742  104004                          HLT+4                   ;DATA ON STACK (135753) CHANGED
3031
3032  013744  022767  024642  164644          CMP     #024642,ANS6    ;CHECK DATA FROM THE STACK
3033  013752  001401                          BEQ     .+4             ;BRANCH IF OK
3034  013754  104004                          HLT+4                   ;DATA ON STACK (024642) CHANGED
3035
3036  013756  010046                  4$:     MOV     R0,     -(SP)   ;RESTORE THE T-BIT
3037  013760  012746  013766                  MOV     #5$,    -(SP)
3038  013764  000002                          RTI
3039  013766  122767  000065  165004  5$:     CMPB    #65,    ICNT    ;CHECK THE TEST NUMBER
3040  013774  001401                          BEQ     .+4             ;BRANCH IF OK
3041  013776  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
3042
3043  014000  104400                          SCOPE
3044
```

```
3045
3046                                    ;*************************************************************************
3047                                    ;TEST 66:       TEST THAT STACK POINTER ADDRESS ERROR CAUSES ABORT
3048                                    ;       INSTRUCTION = FADD,     STACK POINTER = R2
3049                                    ;*************************************************************************
3050
3051  014002  012737  014064  000004  TST66:  MOV     #ISR66, @#4     ;SET UP ADDRESS TRAP VECTOR
3052  014010  012737  000340  000006          MOV     #340,   @#6
3053  014016  004567  002266                  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R2 STACK, SET PRIORITY
3054  014022  070707  016161                  .WORD   070707,016161   ;SECOND OPERAND ON TOP
3055  014026  146314  143434                  .WORD   146314,143434   ;FIRST OPERAND ON BOTTOM
3056  014032  000143                          .WORD   143             ;PROCESSOR PRIORITY LEVEL
3057  014034  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
3058  014040  012702  000631                  MOV     #STACK1,R2      ;SET UP R2 AS STACK POINTER
3059
3060  014044  000240                          NOP
3061  014046  075002                          FADD+   R2              ;FLOATING ADD ON THE R2 STACK
3062
3063  014050  004767  002266          RTA66:  JSR     %7,     POPR    ;POP THE "ANSWER"
3064  014054  010267  164522                  MOV     R2,     $SP     ;SAVE STACK POINTER (R2)
3065  014060  104002                          HLT+2                   ;FIS TRAP DIDN'T OCCURE!
3066  014062  000454                          BR      END66
3067
3068  014064  004767  002304          ISR66:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
3069  014070  010267  164506                  MOV     R2,     $SP     ;SAVE STACK POINTER (R2)
3070  014074  022767  000340  164476          CMP     #340,   $PSW    ;CHECK PS AFTER ADR. ERR. TRAP
3071  014102  001401                          BEQ     .+4             ;BRANCH IF OK
3072  014104  104000                          HLT                     ;PS AFTER TRAP NOT EQUAL TO 340
3073
3074  014106  022767  000631  164466          CMP     #STACK1,$SP     ;CHECK THE STACK POINTER (R2)
3075  014114  001401                          BEQ     .+4             ;BRANCH IF OK
3076  014116  104000                          HLT                     ;STACK POINTER (R2) NOT EQUAL TO #STACK1
3077
3078  014120  022767  014050  164456          CMP     #RTA66, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
3079  014126  001401                          BEQ     .+4             ;BRANCH IF OK
3080  014130  104001                          HLT+1                   ;FIS TRAP AT WRONG ADDRESS
3081
3082  014132  022767  000141  164446          CMP     #141,   ANS2    ;CHECK PS BEFORE FIS TRAP
3083  014140  001401                          BEQ     .+4             ;BRANCH IF OK
3084  014142  104002                          HLT+2                   ;PS AT FIS TRAP TIME NOT 141
3085
3086  014144  022767  070707  164436          CMP     #070707,ANS3    ;CHECK DATA FROM THE STACK
3087  014152  001401                          BEQ     .+4             ;BRANCH IF OK
3088  014154  104004                          HLT+4                   ;DATA ON STACK (070707) CHANGED
3089
3090  014156  022767  016161  164426          CMP     #016161,ANS4    ;CHECK DATA FROM STACK
3091  014164  001401                          BEQ     .+4             ;BRANCH IF OK
3092  014166  104004                          HLT+4                   ;DATA ON STACK (016161) CHANGED
3093
3094  014170  022767  146314  164416          CMP     #146314,ANS5    ;CHECK DATA FROM STACK
3095  014176  001401                          BEQ     .+4             ;BRANCH IF OK
3096  014200  104006                          HLT+6                   ;DATA ON STACK (146314) CHANGED
3097
3098  014202  022767  143434  164406          CMP     #143434,ANS6    ;CHECK DATA FROM STACK
3099  014210  001401                          BEQ     .+4             ;BRANCH IF OK
3100  014212  104006                          HLT+6                   ;DATA ON STACK (143434) CHANGED
```

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3101
3102  014214  122767  000066  164556  END66:  CMPB    #66,    ICNT    ;CHECK THE TEST NUMBER
3103  014222  001401                          BEQ     .+4             ;BRANCH IF OK
3104  014224  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
3105
3106  014226  104400                          SCOPE
3107
3108
3109                                  ;*************************************************************************
3110                                  ;TEST 67:       TEST THAT STACK POINTER ADDRESS ERROR CAUSES ABORT
3111                                  ;       INSTRUCTION = FMUL,     STACK POINTER = R5
3112                                  ;*************************************************************************
3113
3114  014230  012737  014300  000004  TST67:  MOV     #ISR67, @#4     ;SET UP ADDRESS TRAP VECTOR
3115  014236  012737  000340  000006          MOV     #340,   @#6
3116  014244  012737  000202  177776          MOV     #202,   @#PS    ;SET PROCESSOR STATUS
3117  014252  012705  160000                  MOV     #160000,R5      ;SET UP R5 AS STACK POINTER
3118
3119  014256  000240                          NOP
3120  014260  075025                          FMUL+   R5              ;FLOATING MULTIPLY ON THE R5 STACK
3121
3122  014262  013767  177776  164310  RTA67:  MOV     @#PS,   $PSW    ;SAVE THE PSW
3123  014270  010567  164306                  MOV     R5,     $SP     ;SAVE STACK POINTER (R5)
3124  014274  104000                          HLT                     ;FIS TRAP DIDN'T OCCURE!
3125  014276  000430                          BR      END67
3126
3127  014300  004767  002070          ISR67:  JSR     %7,     POPER   ;POP ALL DATA OFF THE STACKS
3128  014304  010567  164272                  MOV     R5,     $SP     ;SAVE STACK POINTER (R5)
3129  014310  022767  000340  164262          CMP     #340,   $PSW    ;CHECK PS AFTER ADR. ERR. TRAP
3130  014316  001401                          BEQ     .+4             ;BRANCH IF OK
3131  014320  104000                          HLT                     ;PS AFTER TRAP NOT EQUAL TO 340
3132
3133  014322  022767  160000  164252          CMP     #160000,$SP     ;CHECK THE STACK POINTER (R5)
3134  014330  001401                          BEQ     .+4             ;BRANCH IF OK
3135  014332  104000                          HLT                     ;STACK POINTER (R5) NOT EQUAL TO #160000
3136
3137  014334  022767  014262  164242          CMP     #RTA67, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
3138  014342  001401                          BEQ     .+4             ;BRANCH IF OK
3139  014344  104001                          HLT+1                   ;FIS TRAP AT WRONG ADDRESS
3140
3141  014346  022767  000210  164232          CMP     #210,   ANS2    ;CHECK PS BEFORE FIS TRAP
3142  014354  001401                          BEQ     .+4             ;BRANCH IF OK
3143  014356  104002                          HLT+2                   ;PS AT FIS TRAP TIME NOT 210
3144
3145  014360  122767  000067  164412  END67:  CMPB    #67,    ICNT    ;CHECK THE TEST NUMBER
3146  014366  001401                          BEQ     .+4             ;BRANCH IF OK
3147  014370  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
3148
3149  014372  104400                          SCOPE
3150
3151  014374  012737  000006  000004          MOV     #6,     @#4     ;RESTORE TIME-OUT VECTOR
3152  014402  005037  000006                  CLR     @#6
```

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3153  014406  012767  000003  001514          MOV     #3,     TIMES   ;REDUCE NUMBER OF ITTERATIONS
3154
3155                                  ;*************************************************************************
3156                                  ;TEST 70:       TEST THAT FIS ABORTS PROPERLY WHEN INTERUPTED
3157                                  ;       101010,020202 - 000000,000000 = 101010,020202
3158                                  ;       PS = 144,       STACK POINTER = R1
3159                                  ;*************************************************************************
3160
3161  014414  012737  014514  000064  TST70:  MOV     #ISR70, @#64    ;SET UP TELEPRINTER INTERUPT VECTOR
3162  014422  012737  000200  000066          MOV     #200,   @#66
3163  014430  000004  017426                  TYPE,   RETURN          ;TYPE CARRIAGE RETURN, LINE FEED
3164  014434  012767  014442  001464          MOV     #.+6,   LADS    ;RESET LOOP ADDRESS
3165  014442  012777  000100  164204          MOV     #100,   @TPS    ;SET TTY INTERUPT ENABLE
3166  014450  012777  000100  164200          MOV     #100,   @TPB    ;TYPE "@"
3167  014456  004567  001626                  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R1 STACK, SET PRIORITY
3168  014462  000000  000000                  .WORD   000000,000000   ;SECOND OPERAND ON TOP
3169  014466  101010  020202                  .WORD   101010,020202   ;FIRST OPERAND ON BOTTOM
3170  014472  000143                          .WORD   143             ;PROCESSOR PRIORITY LEVEL
3171  014474  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
3172  014500  012701  000630                  MOV     #STACK0,R1      ;SET UP STACK POINTER
3173
3174  014504  000240                          NOP
3175  014506  075011                  RTA70:  FSUB+   R1              ;FLOATING SUBTRACT ON THE STACK
3176  014510  024141                          CMP     -(R1),  -(R1)   ;RESET THE STACK POINTER FOR NEXT PASS
3177  014512  000775                          BR      RTA70           ;REPEAT UNTIL INTERUPTED
3178
3179  014514  022716  014506          ISR70:  CMP     #RTA70, (SP)    ;CHECK IF INTERUPT AT FIS INSTR.
3180  014520  001410                          BEQ     1$              ;BRANCH IF IT DID
3181  014522  022766  014506  000004          CMP     #RTA70, 4(SP)   ;CHECK FOR INTERUPT WITH T-BIT SET
3182  014530  001407                          BEQ     2$              ;BRANCH IF IT DID
3183  014532  012777  000100  164116          MOV     #100,   @TPB    ;CONTINUE TO TYPE "@"
3184  014540  000002                          RTI
3185
3186  014542  004767  001626          1$:     JSR     PC,     POPER   ;SAVE ALL THE STUFF ON THE STACK
3187  014546  00040E                          BR      3$
3188
3189  014550  013767  177776  164022  2$:     MOV     @#PS,   $PSW    ;SAVE THE SPW
3190  014556  022626                          CMP     (SP)+,  (SP)+   ;RESET THE STACK TO IGNORE THE TRACE TRAP
3191  014560  004767  001616                  JSR     PC,     POPER1  ;POP ALL THE STUFF OFF THE STACK
3192  014564  005077  164064          3$:     CLR     @TPS            ;CLR INTERUPT ENABLE
3193  014570  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
3194  014574  001406                          BEQ     ISA70           ;BRANCH IF OK
3195  014576  010667  164000                  MOV     SP,     $SP     ;SAVE FOR TYPING
3196  014602  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK POINTER
3197  014606  104000                          HLT                     ;STACK POINTER FOULED UP
3198  014610  000450                          BR      END70           ;SKIP REST OF TEST
3199
3200  014612  010167  163764          ISA70:  MOV     R1,     $SP     ;SAVE STACK POINTER
3201  014616  022767  000204  163754          CMP     #204,   $PSW    ;CHECK PS AFTER INTERUPT
3202  014624  001401                          BEQ     .+4             ;BRANCH IF OK
3203  014626  104000                          HLT                     ;PS AFTER INTERUPT NOT EQUAL TO LVLA
3204
3205  014630  022767  000630  163744          CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R1)
3206  014636  001401                          BEQ     .+4             ;BRANCH IF OK
3207  014640  104000                          HLT                     ;STACK POINTER (R1) NOT EQUAL TO #STACK0
3208
```

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3209  014642  022767  014506  163734          CMP     #RTA70, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
3210  014650  001401                          BEQ     .+4             ;BRANCH IF OK
3211  014652  104001                          HLT+1                   ;FIS TRAP AT WRONG ADDRESS
3212
3213  014654  022767  000144  163724          CMP     #144,   ANS2    ;CHECK PS BEFORE INTERUPT
3214  014662  001401                          BEQ     .+4             ;BRANCH IF OK
3215  014664  104002                          HLT+2                   ;PS AT INTERUPT TIME NOT 144
3216
3217  014666  005767  163716                  TST     ANS3            ;CHECK DATA FROM THE STACK
3218  014672  001401                          BEQ     .+4             ;BRANCH IF OK
3219  014674  104004                          HLT+4                   ;DATA ON STACK (000000) CHANGED
3220
3221  014676  005767  16371C                  TST     ANS4            ;CHECK DATA FROM STACK
3222  014702  001401                          BEQ     .+4             ;BRANCH IF OK
3223  014704  104004                          HLT+4                   ;DATA ON STACK (000000) CHANGED
3224
3225  014706  022767  101010  163700          CMP     #101010,ANS5    ;CHECK DATA FROM STACK
3226  014714  001401                          BEQ     .+4             ;BRANCH IF OK
3227  014716  104006                          HLT+6                   ;DATA ON STACK (101010) CHANGED
3228
3229  014720  022767  020202  163670          CMP     #020202,ANS6    ;CHECK DATA FROM STACK
3230  014726  001401                          BEQ     .+4             ;BRANCH IF OK
3231  014730  104006                          HLT+6                   ;DATA ON STACK (020202) CHANGED
3232
3233  014732  122767  000070  164040  END70:  CMPB    #70,    ICNT    ;CHECK THE TEST NUMBER
3234  014740  001401                          BEQ     .+4             ;BRANCH IF OK
3235  014742  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
3236
3237  014744  104400                          SCOPE
3238
3239
3240                                  ;*************************************************************************
3241                                  ;TEST 71:       TEST THAT FIS ABORTS PROPERLY WHEN INTERUPTED
3242                                  ;       123456,123456 / 040200,000000 = 123456,123456
3243                                  ;       PS = 051,       STACK POINTER = R4
3244                                  ;*************************************************************************
3245
3246  014746  012737  015046  000064  TST71:  MOV     #ISR71, @#64    ;SET UP TELEPRINTER INTERUPT VECTOR
3247  014754  012737  000200  000066          MOV     #200,   @#66
3248  014762  000004  017426                  TYPE,   RETURN          ;TYPE CARRIAGE RETURN, LINE FEED
3249  014766  012767  014774  001132          MOV     #.+6,   LAD$    ;RESET LOOP ADDRESS
3250  014774  012777  000100  163652          MOV     #100,   @TPS    ;SET TTY INTERUPT ENABLE
3251  015002  012777  000100  163646          MOV     #100,   @TPB    ;TYPE "@"
3252  015010  004567  001274                  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R4 STACK, SET PRIORITY
3253  015014  040200  000000                  .WORD   040200,000000   ;SECOND OPERAND ON TOP
3254  015020  123456  123456                  .WORD   123456,123456   ;FIRST OPERAND ON BOTTOM
3255  015024  000040                          .WORD   040             ;PROCESSOR PRIORITY LEVEL
3256  015026  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
3257  015032  012704  000630                  MOV     #STACK0,R4      ;SET UP STACK POINTER
3258
3259  015036  000240                          NOP
3260  015040  075034          RTA71:  FDIV+   R4                      ;FLOATING DIVIDE ON THE STACK
3261  015042  024444                  CMP     -(R4),  -(R4)           ;RESET THE STACK POINTER FOR NEXT PASS
3262  015044  000775                  BR      RTA71                   ;REPEAT UNTIL INTERUPTED
3263
3264  015046  022716  015040          ISR71:  CMP     #RTA71, (SP)    ;CHECK IF INTERUPT AT FIS INSTR.
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```
3265  015052  001410                        BEQ     1$                ;BRANCH IF IT DID
3266  015054  022766  015040  000004        CMP     #RTA71, 4(SP)     ;CHECK FOR INTERUPT WITH T-BIT SET
3267  015062  001407                        BEQ     2$                ;BRANCH IF IT DID
3268  015064  012777  000100  163564        MOV     #100,   @TPB      ;CONTINUE TO TYPE "@"
3269  015072  000002                        RTI
3270
3271  015074  004767  001274        1$:     JSR     PC,     POPER     ;SAVE ALL THE STUFF ON THE STACK
3272  015100  000406                        BR      3$
3273
3274  015102  013767  177776  163470  2$:   MOV     @#PS,   $PSW      ;SAVE THE SPW
3275  015110  022626                        CMP     (SP)+,  (SP)+     ;RESET THE STACK TO IGNORE THE TRACE TRAP
3276  015112  004767  001264                JSR     PC,     POPER1    ;POP ALL THE STUFF OFF THE STACK
3277  015116  005077  163532        3$:     CLR     @TPS              ;CLR INTERUPT ENABLE
3278  015122  022706  000500                CMP     #500,   SP        ;CHECK THE STACK POINTER
3279  015126  001406                        BEQ     ISA71             ;BRANCH IF OK
3280  015130  010667  163446                MOV     SP,     $SP       ;SAVE FOR TYPING
3281  015134  012706  000500                MOV     #500,   SP        ;RESTORE THE STACK POINTER
3282  015140  104000                        HLT                       ;STACK POINTER FOULED UP
3283  015142  000451                        BR      END71             ;SKIP REST OF TEST
3284
3285  015144  010467  163432        ISA71:  MOV     R4,     $SP       ;SAVE STACK POINTER
3286  015150  022767  000204  163422        CMP     #204,   $PSW      ;CHECK PS AFTER INTERUPT
3287  015156  001401                        BEQ     .+4               ;BRANCH IF OK
3288  015160  104000                        HLT                       ;PS AFTER INTERUPT NOT EQUAL TO LVLA
3289
3290  015162  022767  000630  163412        CMP     #STACK0,$SP       ;CHECK THE STACK POINTER (R4)
3291  015170  001401                        BEQ     .+4               ;BRANCH IF OK
3292  015172  104000                        HLT                       ;STACK POINTER (R4) NOT EQUAL TO #STACK0
3293
3294  015174  022767  015040  163402        CMP     #RTA71, ANS1      ;CHECK FIS TRAP RETURN ADDRESS
3295  015202  001401                        BEQ     .+4               ;BRANCH IF OK
3296  015204  104001                        HLT+1                     ;FIS TRAP AT WRONG ADDRESS
3297
3298  015206  022767  000051  163372        CMP     #051,   ANS2      ;CHECK PS BEFORE INTERUPT
3299  015214  001401                        BEQ     .+4               ;BRANCH IF OK
3300  015216  104002                        HLT+2                     ;PS AT INTERUPT TIME NOT 051
3301
3302  015220  022767  040200  163362        CMP     #040200,ANS3      ;CHECK DATA FROM THE STACK
3303  015226  001401                        BEQ     .+4               ;BRANCH IF OK
3304  015230  104004                        HLT+4                     ;DATA ON STACK (040200) CHANGED
3305
3306  015232  005767  163354                TST     ANS4              ;CHECK DATA FROM STACK
3307  015236  001401                        BEQ     .+4               ;BRANCH IF OK
3308  015240  104004                        HLT+4                     ;DATA ON STACK (000000) CHANGED
3309
3310  015242  022767  123456  163344        CMP     #123456,ANS5      ;CHECK DATA FROM STACK
3311  015250  001401                        BEQ     .+4               ;BRANCH IF OK
3312  015252  104006                        HLT+6                     ;DATA ON STACK (123456) CHANGED
3313
3314  015254  022767  123456  163334        CMP     #123456,ANS6      ;CHECK DATA FROM STACK
3315  015262  001401                        BEQ     .+4               ;BRANCH IF OK
3316  015264  104006                        HLT+6                     ;DATA ON STACK (123456) CHANGED
3317
3318  015266  122767  000071  163504  END71:  CMPB    #71,    ICNT      ;CHECK THE TEST NUMBER
3319  015274  001401                        BEQ     .+4               ;BRANCH IF OK
3320  015276  104000                        HLT                       ;WRONG TEST!  PC MUST HAVE FOULED UP.
```

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3321
3322  015300  104400                          SCOPE
3323
3324
3325                                ;**********************************************************************
3326                                ;TEST 72:       TEST THAT FIS ABORTS PROPERLY WHEN INTERUPTED
3327                                ;       107070,070707 * 040200,000000 = 107070,070707
3328                                ;       PS = 111,       STACK POINTER = R0
3329                                ;**********************************************************************
3330
3331  015302  012737  015402  000064  TST72:  MOV     #ISR72, @#64    ;SET UP TELEPRINTER INTERUPT VECTOR
3332  015310  012737  000200  000066          MOV     #200,   @#66
3333  015316  000004  017426                  TYPE,   RETURN          ;TYPE CARRIAGE RETURN, LINE FEED
3334  015322  012767  015330  000576          MOV     #.+6,   LAD$    ;RESET LOOP ADDRESS
3335  015330  012777  000100  163316          MOV     #100,   @TPS    ;SET TTY INTERUPT ENABLE
3336  015336  012777  000100  163312          MOV     #100,   @TPB    ;TYPE "@"
3337  015344  004567  000740                  JSR     R5,     PUSHR   ;PUSH 4 WORDS ONTO R0 STACK, SET PRIORITY
3338  015350  040200  000000                  .WORD   040200,000000   ;SECOND OPERAND ON TOP
3339  015354  107070  070707                  .WORD   107070,070707   ;FIRST OPERAND ON BOTTOM
3340  015360  000100                          .WORD   100             ;PROCESSOR PRIORITY LEVEL
3341  015362  016574  000340                  .WORD   TRAPER, 340     ;FIS TRAP VECTOR
3342  015366  012700  000630                  MOV     #STACK0,R0      ;SET UP STACK POINTER
3343
3344  015372  000240                          NOP
3345  015374  075020          RTA72:  FMUL+   R0                      ;FLOATING MULTIPLY ON THE STACK
3346  015376  024040                  CMP     -(R0),  -(R0)           ;RESET THE STACK POINTER FOR NEXT PASS
3347  015400  000775                  BR      RTA72                   ;REPEAT UNTIL INTERUPTED
3348
3349  015402  022716  015374  ISR72:  CMP     #RTA72, (SP)            ;CHECK IF INTERUPT AT FIS INSTR.
3350  015406  001410                  BEQ     1$                      ;BRANCH IF ?? ???
3351  015410  022766  015374  000004          CMP     #RTA72, 4(SP)   ;CHECK FOR INTERUPT WITH T-BIT SET
3352  015416  001407                  BEQ     2$                      ;BRANCH IF IT DID
3353  015420  012777  000100  163230          MOV     #100,   @TPB    ;CONTINUE TO TYPE "@"
3354  015426  000002                  RTI
3355
3356  015430  004767  000740  1$:     JSR     PC,     POPER   ;SAVE ALL THE STUFF ON THE STACK
3357  015434  000406                  BR      3$
3358
3359  015436  013767  177776  163134  2$:     MOV     @#PS,   $PSW    ;SAVE THE SPW
3360  015444  022626                  CMP     (SP)+,  (SP)+   ;RESET THE STACK TO IGNORE THE TRACE TRAP
3361  015446  004767  000730                  JSR     PC,     POPER1  ;POP ALL THE STUFF OFF THE STACK
3362  015452  005077  163176  3$:     CLR     @TPS            ;CLR INTERUPT ENABLE
3363  015456  022706  000500                  CMP     #500,   SP      ;CHECK THE STACK POINTER
3364  015462  001406                  BEQ     ISA72           ;BRANCH IF OK
3365  015464  010667  163112                  MOV     SP,     $SP     ;SAVE FOR TYPING
3366  015470  012706  000500                  MOV     #500,   SP      ;RESTORE THE STACK POINTER
3367  015474  104000                  HLT                     ;STACK POINTER FOULED UP
3368  015476  000451                  BR      END72           ;SKIP REST OF TEST
3369
3370  015500  010067  163076  ISA72:  MOV     R0,     $SP     ;SAVE STACK POINTER
3371  015504  022767  000204  163066          CMP     #204,   $PSW    ;CHECK PS AFTER INTERUPT
3372  015512  001401                  BEQ     .+4             ;BRANCH IF OK
3373  015514  104000                  HLT                     ;PS AFTER INTERUPT NOT EQUAL TO LVLA
3374
3375  015516  022767  000630  163056          CMP     #STACK0,$SP     ;CHECK THE STACK POINTER (R0)
3376  015524  001401                  BEQ     .+4             ;BRANCH IF OK
```

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3377  015526  104000                          HLT                     ;STACK POINTER (R0) NOT EQUAL TO #STACK0
3378
3379  015530  022767  015374  163046          CMP     #RTA72, ANS1    ;CHECK FIS TRAP RETURN ADDRESS
3380  015536  001401                          BEQ     .+4             ;BRANCH IF OK
3381  015540  104001                          HLT+1                   ;FIS TRAP AT WRONG ADDRESS
3382
3383  015542  022767  000111  163036          CMP     #111,   ANS2    ;CHECK PS BEFORE INTERUPT
3384  015550  001401                          BEQ     .+4             ;BRANCH IF OK
3385  015552  104002                          HLT+2                   ;PS AT INTERUPT TIME NOT 111
3386
3387  015554  022767  040200  163026          CMP     #040200,ANS3    ;CHECK DATA FROM THE STACK
3388  015562  001401                          BEQ     .+4             ;BRANCH IF OK
3389  015564  104004                          HLT+4                   ;DATA ON STACK (040200) CHANGED
3390
3391  015566  005767  163020                  TST     ANS4            ;CHECK DATA FROM STACK
3392  015572  001401                          BEQ     .+4             ;BRANCH IF OK
3393  015574  104004                          HLT+4                   ;DATA ON STACK (000000) CHANGED
3394
3395  015576  022767  107070  163010          CMP     #107070,ANS5    ;CHECK DATA FROM STACK
3396  015604  001401                          BEQ     .+4             ;BRANCH IF OK
3397  015606  104006                          HLT+6                   ;DATA ON STACK (107070) CHANGED
3398
3399  015610  022767  070707  163000          CMP     #070707,ANS6    ;CHECK DATA FROM STACK
3400  015616  001401                          BEQ     .+4             ;BRANCH IF OK
3401  015620  104006                          HLT+6                   ;DATA ON STACK (070707) CHANGED
3402
3403  015622  122767  000072  163150  END72:  CMPB    #72,    ICNT    ;CHECK THE TEST NUMBER
3404  015630  001401                          BEQ     .+4             ;BRANCH IF OK
3405  015632  104000                          HLT                     ;WRONG TEST!  PC MUST HAVE FOULED UP.
3406
3407  015634  104400                          SCOPE
3408
3409  015636  012767  000377  000264          MOV     #377,   TIMES   ;RESET NUMBER OF ITERATIONS
3410  015644  012737  000062  000060          MOV     #62,    @#60    ;RESTORE TTY INTERUPT VECTOR
3411  015652  005037  000062                  CLR     @#62
3412
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3413  015656  000240                        DONE:   NOP
3414  015660  032737  002000  177570                BIT     #SW10,@#SWR     ;RING THE BELL?
3415  015666  001002                                BNE     1$              ;NO!
3416  015670  000004  000007                        TYPE    ,BELL
3417  015674  005046                        1$:     CLR     -(6)            ;CLEAR TRACE TRAP
3418  015676  032737  010000  177570                BIT     #SW12,@#SWR     ;RUN WITH TRT?
3419  015704  001010                                BNE     2$
3420  015706  005167  000056                        COM     .TBIT
3421  015712  100005                                BPL     2$
3422  015714  052716  000020                        BIS     #20,(6)         ;SET TRACE TRAP
3423  015720  012746  015752                        MOV     #3$,-(6)        ;JUMP TO START OF TEST
3424  015724  000002                                RTI
3425  015726  012746  015734                2$:     MOV     #4$,-(6)        ;JUMP TO START OF TEST
3426  015732  000002                                RTI                     ;RETURN
3427  015734  013700  000042                4$:     MOV     @#42,R0         ;GET MONITOR ADDRESS
3428  015740  001404                                BEQ     3$              ;IF NONE
3429  015742  004710                                JSR     7,(0)           ;GO TO MONITOR
3430  015744  000240                                NOP
3431  015746  000240                                NOP
3432  015750  000240                                NOP
3433  015752  062767  000001  163026        3$:     ADD     #1,PASSES+2     ;INC PASS COUNTER
3434  015760  005567  163020                        ADC     PASSES
3435  015764  000137  000200                        JMP     @#200           ;RETURN
3436
3437  015770  000000                        .TBIT:  0
3438
3439  015772  000006                        YESRT:  RTT                     ;RETURN FROM TRACE TRAP
3440  015774  032737  000400  177570        SCOPE$: BIT     #SW08,@#SWR     ;KILL LDUB OR LOOP ON SPEC. TEST
3441  016002  001404                                BEQ     1$
3442  016004  123767  177570  162766                CMPB    @#SWR,ICNT      ;ON RIGHT TEST?   *SW7-0*
3443  016012  001434                                BEQ     OVER$
3444  016014  032737  040000  177570        1$:     BIT     #SW14,@#SWR     ;LOOP ON TEST
3445  016022  001026                                BNE     KIT$
3446  016024  032737  004000  177570                BIT     #SW11,@#SWR     ;KILL ITERATIONS
3447  016032  001012                                BNE     SVLAD$
3448  016034  105767  162741                        TSTB    ICNT+1
3449  016040  001404                                BEQ     2$              ;BRANCH IF FIRST
3450  016042  126767  000062  162731                CMPB    TIMES,ICNT+1    ;DONE?
3451  016050  001013                                BNE     KIT$            ;BRANCH IF NOT
3452  016052  112767  000001  162721        2$:     MOVB    #1,ICNT+1       ;FIRST ITERATION
3453  016060  105267  162714                SVLAD$: INCB    ICNT            ;COUNT TEST NUMBERS
3454  016064  011667  000036                        MOV     (6),LAD$        ;SAVE LOOP ADDRESS
3455  016070  016737  162704  177570                MOV     ICNT,@#DISPLAY  ;DISPLAY TEST NO. AND ITERATION COUNT
3456  016076  000002                                RTI                     ;RETURN
3457
3458  016100  105267  162675                KIT$:   INCB    ICNT+1
3459  016104  016737  162670  177570        OVER$:  MOV     ICNT,@#DISPLAY  ;SET UP DISPLAY
3460  016112  005767  000010                        TST     LAD$            ;FIRST ONE?
3461  016116  001760                                BEQ     SVLAD$
3462  016120  016716  000002                        MOV     LAD$,(6)        ;FUDGE RETURN ADDRESS
3463  016124  000002                                RTI                     ;FIXES PS
3464
3465  016126  000000                        LAD$:   0                       ;LOOP ADDRESS
3466  016130  000377                        TIMES:  377                     ;RUN 377 TIMES
```

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3467
3468                                        ;SUBROUTINE TO PUSH 4 WORDS ONTO THE STACK
3469
3470  016132  005726                        PUSHS:  TST     (SP)+           ;POP STACK BY 1
3471  016134  062705  000010                        ADD     #10,    R5      ;POINT TO END OF DATA
3472  016140  014546                        MOV     -(R5),  -(SP)   ;PUSH DATA ONTO THE STACK
3473  016142  014546                        MOV     -(R5),  -(SP)   ;PUSH DATA ONTO THE STACK
3474  016144  014546                        MOV     -(R5),  -(SP)   ;PUSH DATA ONTO THE STACK
3475  016146  014546                        MOV     -(R5),  -(SP)   ;PUSH DATA ONTO THE STACK
3476  016150  062705  000010                        ADD     #10,    R5      ;POINT TO END OF DATA
3477  016154  012537  177776                MOV     (R5)+,  @#PS    ;SET THE PROCESSOR STATUS
3478  016160  012577  162464                MOV     (R5)+,  @FISVEC ;SET UP FIS ERROR TRAP VECTOR
3479  016164  012577  162462                MOV     (R5)+,  @FISLVL ;TRAP STATUS
3480  016170  000115                        JMP     (R5)            ;RETURN
3481
3482
3483                                        ;SUBROUTINE TO POP 2 WORDS OFF THE STACK
3484                                        ;ALSO SAVES THE PROCESSOR STATUS WORD (EXCEPT T BIT)
3485
3486  016172  013767  177776  162400  POPS:   MOV     @#PS,   $PSW    ;SAVE PROCESSOR STATUS WORD
3487  016200  042767  000020  162372          BIC     #20,    $PSW    ;CLEAR T-BIT
3488  016206  012604                        MOV     (SP)+,  R4      ;SAVE RTS ADDRESS
3489  016210  012667  162370                MOV     (SP)+,  ANS1    ;SAVE THE ANSWER
3490  016214  012667  162366                MOV     (SP)+,  ANS2    ;
3491  016220  010667  162356                MOV     SP,     $SP     ;SAVE THE STACK POINTER
3492  016224  000114                        JMP     (R4)            ;RETURN
3493
3494
3495                                        ;SUBROUTNE TO POP 6 WORDS OFF THE STACK.
3496                                        ;THE FIRST TWO WERE PUT ON BY THE ERROR TRAP,
3497                                        ;THE LAST FOUR WERE THE ORIGINAL INPUT DATA.
3498                                        ;ALSO SAVES THE PS AND STACK POINTER.
3499
3500  016226  013767  177776  162344  POPES:  MOV     @#PS,   $PSW    ;SAVE PROCESSOR STATUS WORD
3501  016234  012604                        MOV     (SP)+,  R4      ;SAVE RTS ADDRESS
3502  016236  012667  162342                MOV     (SP)+,  ANS1    ;SAVE RTI ADDRESS
3503  016242  011667  162340                MOV     (SP),   ANS2    ;SAVE RTI STATUS
3504  016246  042767  000020  162332        BIC     #20,    ANS2    ;CLEAR THE T-BIT
3505  016254  012746  016262                MOV     #1$,    -(SP)
3506  016260  000002                        RTI                     ;RESTORE THE PROCESSOR STATUS
3507  016262  012667  162322          1$:   MOV     (SP)+,  ANS3    ;SAVE DATA
3508  016266  012667  162320                MOV     (SP)+,  ANS4    ;
3509  016272  012667  162316                MOV     (SP)+,  ANS5    ;
3510  016276  012667  162314                MOV     (SP)+,  ANS6    ;
3511  016302  010667  162274                MOV     SP,     $SP     ;SAVE SP
3512  016306  000114                        JMP     (R4)            ;RTS
3513
3514                                        ;SUBROUTINE TO PUSH 4 WORDS ONTO THE STACK
3515
3516  016310  012704  000630          PUSHR:  MOV     #STACKO,R4      ;SET R4 TO STACK
3517  016314  012524                        MOV     (R5)+,  (R4)+   ;PUT DATA ON STACK
3518  016316  012524                        MOV     (R5)+,  (R4)+   ;
3519  016320  012524                        MOV     (R5)+,  (R4)+   ;
3520  016322  012524                        MOV     (R5)+,  (R4)+   ;
3521  016324  012537  177776                MOV     (R5)+,  @#PS    ;SET THE PROCESSOR STATUS
3522  016330  012577  162314                MOV     (R5)+,  @FISVEC ;SET UP FIS ERROR TRAP VECTOR
```

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3523  016334  012577  162312                  MOV     (R5)+,  @FISLVL ;TRAP STATUS
3524  016340  000205                          RTS     R5              ;RETURN
3525
3526
3527                                  ;SUBROUTINE TO POP 2 WORDS OFF THE STACK
3528                                  ;ALSO SAVES THE PROCESSOR STATUS WORD (EXCEPT T BIT)
3529
3530  016342  013767  177776  162230  POPR:   MOV     @#PS,   $PSW    ;SAVE PROCESSOR STATUS WORD
3531  016350  042767  000020  162222          BIC     #20,    $PSW    ;CLEAR T-BIT
3532  016356  016767  162252  162220          MOV     STACK4, ANS1    ;SAVE THE ANSWER
3533  016364  016767  162246  162214          MOV     STACK6, ANS2    ;
3534  016372  000207                          RTS     %7
3535
3536
3537                                  ;SUBROUTNE TO POP 6 WORDS OFF THE STACKS.
3538                                  ;THE TWO OFF THE R6 STACK WERE PUT ON BY THE ERROR TRAP,
3539                                  ;THE FOUR OFF THE SOFTWARE STACK WERE THE ORIGINAL INPUT DATA.
3540                                  ;ALSO SAVES THE PS AND STACK POINTER AFTER THE FIS TRAP.
3541
3542  016374  013767  177776  162176  POPER:  MOV     @#PS,   $PSW    ;SAVE PROCESSOR STATUS WORD
3543  016402  012667  000056          POPER1: MOV     (SP)+,  SAVRTS  ;SAVE RTS ADDRESS
3544  016406  012667  162172                  MOV     (SP)+,  ANS1    ;SAVE RTI ADDRESS
3545  016412  011667  162170                  MOV     (SP),   ANS2    ;SAVE RTI STATUS
3546  016416  042767  000020  162162          BIC     #20,    ANS2    ;CLEAR THE T-BIT
3547  016424  012746  016432                  MOV     #1$,    -(SP)
3548  016430  000002                          RTI                     ;RESTORE PROCESSOR STATUS
3549  016432  016767  162172  162150  1$:     MOV     STACK0, ANS3    ;SAVE DATA
3550  016440  016767  162166  162144          MOV     STACK2, ANS4    ;
3551  016446  016767  162162  162140          MOV     STACK4, ANS5    ;
3552  016454  016767  162156  162134          MOV     STACK6, ANS6    ;
3553  016462  000137                          JMP     @(%7)+          ;SIMULATED RTS
3554  016464  000000                  SAVRTS: 0                       ;RTS ADDRESS SAVE
3555
3556                                  ;SUBROUTINE TO PUSH 4 WORDS ONTO THE PC STACK
3557
3558  016466  012504                  PUSH7:  MOV     (R5)+,  R4      ;SET R4 TO STACK
3559  016470  012524                          MOV     (R5)+,  (R4)+   ;PUT DATA ON STACK
3560  016472  012524                          MOV     (R5)+,  (R4)+   ;
3561  016474  012524                          MOV     (R5)+,  (R4)+   ;
3562  016476  012524                          MOV     (R5)+,  (R4)+   ;
3563  016500  042737  177757  177776          BIC     #177757,@#PS    ;CLEAR STATUS EXCEPT T-BIT
3564  016506  052537  177776                  BIS     (R5)+,  @#PS    ;SET THE PROCESSOR STATUS
3565  016512  012577  162132                  MOV     (R5)+,  @FISVEC ;SET UP FIS ERROR TRAP VECTOR
3566  016516  012577  162130                  MOV     (R5)+,  @FISLVL ;TRAP STATUS
3567  016522  000205                          RTS     R5              ;RETURN
3568
3569                                  ;SUBROUTINE TO POP 4 WORDS OFF THE PC "STACK"
3570                                  ;ALSO SAVES THE PROCESSOR STATUS WORD (EXCEPT T BIT)
3571
3572  016524  013767  177776  162046  POP7:   MOV     @#PS,   $PSW    ;SAVE PROCESSOR STATUS WORD
3573  016532  042767  000020  162040          BIC     #20,    $PSW    ;CLEAR T-BIT
3574  016540  011600                          MOV     (SP),   R0      ;GET RETURN ADDRESS
3575  016542  162700  000014                  SUB     #14,    R0      ;POINT TO TOP OF "PC STACK"
3576  016546  012067  162032                  MOV     (R0)+,  ANS1    ;SAVE 1ST HALF INPUT DATA
3577  016552  012067  162030                  MOV     (R0)+,  ANS2    ;SAVE 2ND HALF INPUT DATA
3578  016556  010067  162020                  MOV     R0,     $SP     ;SAVE ASSUMED END PC "STACK POINTER"
```

```
3579  016562  012067  162022                  MOV     (R0)+,  ANS3    ;SAVE 1ST HALF OF ANSWER
3580  016566  012067  162020                  MOV     (R0)+,  ANS4    ;SAVE 2ND HALF OF ANSWER
3581  016572  000207                          RTS     %7
3582
3583                                  ;ERRONIOUS TRAP SERVICE ROUTINE
3584
3585  016574  104000                  TRAPER: HLT                     ;FIS SHOULDN'T HAVE TRAPED
3586  016576  000002                          RTI
3587
3588  016600  032737  002000  177570  HLT$:   BIT     #SW10,@#SWR     ;BELL ON ERROR?
3589  016606  001402                          BEQ     1$              ;NO - SKIP
3590  016610  000004  000007                  TYPE    ,BELL           ;RING BELL
3591  016614  005267  162162          1$:     INC     ERRORS          ;COUNT THE NUMBER OF ERRORS
3592  016620  032737  020000  177570          BIT     #SW13,@#SWR     ;SKIP TYPEOUT IF SET
3593  016626  001017                          BNE     2$              ;SKIP TYPEOUTS
3594  016630  000004  017426                  TYPE    ,RETURN
3595  016634  011667  000060                  MOV     (6),HLTAD$      ;PUT ADDRESS OF INSTRUCTION ON STACK
3596  016640  162767  000002  000052          SUB     #2,HLTAD$
3597  016646  016705  000046                  MOV     HLTAD$,TTY      ;TYPE HLTAD$ IN OCTAL
3598  016652  004767  000106                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
3599  016656  000004  017434                  TYPE    ,SPACE+3
3600  016662  004767  000034                  JSR     PC,ERROR$       ;GO TO USER ERROR ROUTINE
3601  016666  005737  177570          2$:     TST     @#SWR           ;HALT ON ERROR
3602  016672  100001                          BPL     .+4             ;SKIP IF CONTINUE
3603  016674  000000                          HALT                    ;HALT ON ERROR!
3604  016676  032737  001000  177570          BIT     #SW09,@#SWR     ;CHECK FOR INHIBIT LOOP ON ERROR
3605  016704  001001                          BNE     .+4             ;SKIP IF LOOP ON ERROR
3606  016706  000002                          RTI
3607  016710  105067  162065                  CLRB    ICNT+1
3608  016714  000167  177160                  JMP     KIT$            ;LOOP ON TEST UNTIL NO ERRORS
3609
3610  016720  000000                  HLTAD$: 0
3611
3612  016722  117767  177772  000032  ERROR$: MOVB    @HLTAD$,TYPCNT  ;TYPE COUNT IS LOW BYTE OF HLT
3613  016730  105267  000026                  INCB    TYPCNT          ;TYPE COUNT = X+1
3614  016734  012703  000600                  MOV     #$PSW,  R3      ;TOP OF DATA TO BE TYPED
3615  016740                          ERR1$:
3616  016740  012305                          MOV     (R3)+,TTY       ;TYPE (R3)+ IN OCTAL
3617  016742  004767  000016                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
3618  016746  000004  017435                  TYPE,   SPACE+4         ;SPACE
3619  016752  105367  000004                  DECB    TYPCNT          ;CHECK FOR DONE
3620  016756  100370                          BPL     ERR1$           ;BRANCH IF NOT DONE
3621  016760  000207                          RTS     PC
3622
3623  016762  000000                  TYPCNT: 0
```

```
3624  016764  112767  000001  000130  PRINTR: MOVB    #1,.PR          ;SET ZERO FILL SWITCH
3625  016772  000402                          BR      .+6             ;SKIP
3626  016774  005067  000122          PRINTS: CLR     .PR             ;SUPRESS LEADING ZERO'S
3627  017000  112767  177772  000115          MOVB    #-6,.PR+1       ;SET COUNT
3628  017006  010446                          MOV     R4,-(6)         ;SAVE R4
3629  017010  012704  017112                  MOV     #.PRBUF,R4      ;SET POINTER TO FIRST ASCII CHAR.
3630  017014  105014                          CLRB    (4)             ;CLEAR FIRST BYTE
3631  017016  000405                          BR      .PRF            ;ROTATE FIRST BIT
3632  017020  105014                  .PRL:   CLRB    (4)             ;CLEAR BYTE OF CHARACTER
3633  017022  006105                          ROL     TTY             ;ROTATE BIT INTO C
3634  017024  106114                          ROLB    (4)             ;PACK IT
3635  017026  006105                          ROL     TTY             ;ROTATE BIT INTO C
3636  017030  106114                          ROLB    (4)             ;PACK IT
3637  017032  006105                  .PRF:   ROL     TTY             ;ROTATE BIT INTO C
3638  017034  106114                          ROLB    (4)             ;PACK IT
3639  017036  105714                          TSTB    (4)             ;IS IT ZERO?
3640  017040  001402                          BEQ     .+6             ;SKIP INC
3641  017042  105267  000054                  INCB    .PR             ;SET FILL SWITCH
3642  017046  105767  000050                  TSTB    .PR             ;CHECK FILL SWITCH
3643  017052  001402                          BEQ     .+6             ;SKIP BITSET
3644  017054  152724  000060                  BISB    #'0,(4)+        ;MAKE INTO ASCII CHAR
3645  017060  105267  000037                  INCB    .PR+1           ;INC COUNT
3646  017064  001355                          BNE     .PRL            ;REPEAT
3647  017066  022704  017112                  CMP     #.PRBUF,R4      ;EMPTY BUFFER?
3648  017072  001002                          BNE     .+6             ;SKIP IF NOT
3649  017074  112724  000060                  MOVB    #'0,(4)+        ;LOAD 1 ZERO
3650  017100  105014                          CLRB    (4)             ;NULL TERMINATOR
3651  017102  000004  017112                  TYPE    .PRBUF          ;TYPE IT
3652  017106  012604                          MOV     (6)+,R4         ;RESTORE R4
3653  017110  000207                          RTS     PC              ;RETURN
3654
3655  017112  000004                  .PRBUF: .BLKW   4               ;OUTPUT BUFFER
3656  017122  000000                  .PR:    0                       ;COUNT AND SWITCH
```

```
3657  017124  012777  017272  000154  PDOWN$: MOV     #ILLUP,@PUVEC$  ;SET FOR FAST UP
3658  017132  012777  000340  000150          MOV     #340,@PUVEC$+2  ;PRIO:7
3659  017140  017767  161510  000132          MOV     @TPS,   SAVTPS  ;SAVE TELEPRINTER STATUS
3660  017146  010046                          MOV     R0,-(6)         ;PUSH R0 ON STACK
3661  017150  010146                          MOV     R1,-(6)         ;PUSH R1 ON STACK
3662  017152  010246                          MOV     R2,-(6)         ;PUSH R2 ON STACK
3663  017154  010346                          MOV     R3,-(6)         ;PUSH R3 ON STACK
3664  017156  010446                          MOV     R4,-(6)         ;PUSH R4 ON STACK
3665  017160  010546                          MOV     R5,-(6)         ;PUSH R5 ON STACK
3666  017162  010667  000110                  MOV     SP,.SAVR6       ;SAVE SP
3667  017166  012777  017176  000112          MOV     #PUP$,@PUVEC$   ;SET UP VECTOR
3668  017174  000000                          HALT
3669
3670  017176  016706  000074          PUP$:   MOV     .SAVR6,SP       ;GET SP
3671  017202  005001                          CLR     R1              ;WAIT LOOP FOR THE TTY
3672  017204  005201                  1$:     INC     R1              ;WAIT FOR THE INC
3673  017206  001376                          BNE     1$              ;OF A WORD
3674  017210  012605                          MOV     (6)+,R5         ;POP STACK INTO R5
3675  017212  012604                          MOV     (6)+,R4         ;POP STACK INTO R4
3676  017214  012603                          MOV     (6)+,R3         ;POP STACK INTO R3
3677  017216  012602                          MOV     (6)+,R2         ;POP STACK INTO R2
3678  017220  012601                          MOV     (6)+,R1         ;POP STACK INTO R1
3679  017222  012600                          MOV     (6)+,R0         ;POP STACK INTO R0
3680  017224  012777  017124  000050          MOV     #PDOWN$,@PDVEC$ ;SET UP THE POWER DOWN VECTOR
3681  017232  012777  000340  000044          MOV     #340,@PDVEC$+2  ;PRIO:7
3682  017240  000004  017312                  TYPE    ,POWER$
3683  017244  032767  000100  000026          BIT     #100,   SAVTPS  ;CHECK INT ENB BIT
3684  017252  001406                          BEQ     2$              ;BRANCH IF NOT
3685  017254  012777  000100  161372          MOV     #100,   @TPS    ;SET INT ENB
3686  017262  012777  000100  161366          MOV     #100,   @TPB    ;TYPE AN "@"
3687  017270  000002                  2$:     RTI
3688
3689  017272  000000                  ILLUP:  HALT                    ;THE POWER UP SEQUENCE WAS STARTED
3690  017274  000776                          BR      .-2             ; BEFORE THE POWER DOWN WAS COMPLETE
3691
3692  017276  000000                  .SAVR6: 0                       ;PUT THE SP HERE
3693  017300  000000                  SAVTPS: 0                       ;LOC TO SAVE TELEPRINTER STATUS
3694  017302  000024  000026          PDVEC$: 24,26                   ;POWER DOWN VECTOR
3695  017306  000024  000026          PUVEC$: 24,26                   ;POWER UP VECTOR
3696  017312  005015  047520  042527  POWER$: .ASCIZ  <15><12>"POWER"
3697  017320  000122
3698                                          .EVEN
```

```
3699  017322  010546                    .IOT:   MOV     TTY,-(6)          ;SAVE TTY
3700  017324  017605  000002                    MOV     @2(6),TTY         ;GET ADDRESS TO BE TYPED
3701  017330  032705  177400                    BIT     #177400,TTY       ;IS IT A TYPEM?
3702  017334  001004                            BNE     1$                ;NO
3703  017336  010567  000076                    MOV     TTY,.TYPE         ;GET THE CHARACTER
3704  017342  012705  017440                    MOV     #.TYPE,TTY        ;FUDGE THE ADDRESS
3705  017346  105715                  1$:       TSTB    (TTY)             ;TERMINATOR?
3706  017350  001406                            BEQ     2$                ;GET OUT IF SO
3707  017352  112537  177566                    MOVB    (TTY)+,@#177566   ;LOAD AND TYPE THE CHARACTER
3708  017356  105737  177564                    TSTB    @#177564          ;IS THE PRINTER READY
3709  017362  100375                            BPL     .-4               ;WAIT UNTIL IT IS
3710  017364  000770                            BR      1$                ;GET THE NEXT CHARACTER
3711  017366  017646  000002            2$:     MOV     @2(6),-(6)        ;GET ADDRESS TO BE TYPED
3712  017372  062766  000002  000004            ADD     #2,4(6)           ;ADD 2 TO THE ADDRESS
3713  017400  022666  000002                    CMP     (6)+,2(6)         ;IS IT .+2?
3714  017404  001006                            BNE     3$                ;NO
3715  017406  062705  000002                    ADD     #2,TTY            ;ADD 2 TO THE ADDRESS
3716  017412  042705  000001                    BIC     #1,TTY            ;BACK UP TO AN EVEN BYTE
3717  017416  010566  000002                    MOV     TTY,2(6)          ;RESTORE ADDRESS
3718  017422  012605                  3$:       MOV     (6)+,TTY          ;RESTORE TTY
3719  017424  000002                            RTI                       ;RETURN
3720
3721  017426  005015     000          RETURN:  .ASCIZ  <15><12>          ;RETURN AND LINEFEED
3722  017431     015  020012  020040  SPACE:   .ASCIZ  <15><12>"   "     ;RETURN AND 3 SPACES
3723  017436     000
3724          017440                    .EVEN
3725  017440  000000                    .TYPE:   0                        ;CHARACTER TYPE LOCATION
3726          000001                    .END
```

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANS1 | 000604 | 405# | 475 | 516 | 557 | 598 | 639 | 680 | 721 | 762 | 808 | 865 | 911 | 968 |
| | | 1009 | 1055 | 1112 | 1158 | 1215 | 1256 | 1297 | 1338 | 1384 | 1441 | 1497 | 1544 | 1585 |
| | | 1626 | 1667 | 1708 | 1749 | 1790 | 1831 | 1872 | 1918 | 1975 | 2021 | 2078 | 2124 | 2181 |
| | | 2227 | 2284 | 2330 | 2387 | 2433 | 2490 | 2536 | 2592 | 2640 | 2688 | 2736 | 2788* | 2799 |
| | | 2845 | 2858 | 2915* | 2931 | 2996* | 3012 | 3078 | 3137 | 3209 | 3294 | 3379 | 3489* | 3502* |
| | | 3532* | 3544* | 3576* | | | | | | | | | | |
| ANS2 | 000606 | 406# | 479 | 520 | 561 | 602 | 643 | 684 | 725 | 766 | 812 | 869 | 915 | 972 |
| | | 1013 | 1059 | 1116 | 1162 | 1219 | 1260 | 1301 | 1342 | 1388 | 1445 | 1491 | 1548 | 1589 |
| | | 1630 | 1671 | 1712 | 1753 | 1794 | 1835 | 1876 | 1922 | 1979 | 2025 | 2082 | 2128 | 2185 |
| | | 2231 | 2288 | 2334 | 2391 | 2437 | 2494 | 2540 | 2596 | 2644 | 2692 | 2740 | 2789* | 2803 |
| | | 2862 | 2916* | 2935 | 2997* | 3016 | 3082 | 3141 | 3213 | 3298 | 3383 | 3490* | 3503* | 3504* |
| | | 3533* | 3545* | 3546* | 3577* | | | | | | | | | |
| ANS3 | 000610 | 407# | 816 | 919 | 1063 | 1166 | 1392 | 1495 | 1926 | 2029 | 2132 | 2235 | 2338 | 2441 |
| | | 2544 | 2600 | 2648 | 2696 | 2744 | 2866 | 2918 | 2939 | 2999 | 3020 | 3086 | 3217 | 3302 |
| | | 3387 | 3507* | 3549* | 3579* | | | | | | | | | |
| ANS4 | 000612 | 408# | 820 | 923 | 1067 | 1170 | 1396 | 1499 | 1930 | 2033 | 2136 | 2239 | 2342 | 2445 |
| | | 2548 | 2604 | 2652 | 2700 | 2748 | 2870 | 2943 | 3024 | 3090 | 3221 | 3306 | 3391 | 3508* |
| | | 3550* | 3580* | | | | | | | | | | | |
| ANS5 | 000614 | 409# | 824 | 927 | 1071 | 1174 | 1400 | 1503 | 1934 | 2037 | 2140 | 2243 | 2346 | 2449 |
| | | 2552 | 2947 | 3028 | 3094 | 3225 | 3310 | 3395 | 3509* | 3551* | | | | |
| ANS6 | 000616 | 410# | 828 | 931 | 1075 | 1178 | 1404 | 1507 | 1938 | 2041 | 2144 | 2247 | 2350 | 2453 |
| | | 2556 | 2951 | 3032 | 3098 | 3229 | 3314 | 3399 | 3510* | 3552* | | | | |
| BEGIN | 001010 | 400 | 432# | | | | | | | | | | | |
| BELL = | 000007 | 378# | 3416 | 3590 | | | | | | | | | | |
| DISPLA= | 177570 | 377# | 3455* | 3459* | | | | | | | | | | |
| DONE | 015656 | 3413# | | | | | | | | | | | | |
| END1 | 001226 | 483# | | | | | | | | | | | | |
| END10 | 002334 | 770# | | | | | | | | | | | | |
| END11 | 002542 | 796 | 832# | | | | | | | | | | | |
| END12 | 002666 | 873# | | | | | | | | | | | | |
| END13 | 003072 | 898 | 905 | 935# | | | | | | | | | | |
| END14 | 003212 | 962 | 976# | | | | | | | | | | | |
| END15 | 003334 | 1003 | 1017# | | | | | | | | | | | |
| END16 | 003546 | 1043 | 1079# | | | | | | | | | | | |
| END17 | 003674 | 1120# | | | | | | | | | | | | |
| END2 | 001352 | 524# | | | | | | | | | | | | |
| END20 | 004102 | 1145 | 1152 | 1182# | | | | | | | | | | |
| END21 | 004230 | 1223# | | | | | | | | | | | | |
| END22 | 004354 | 1264# | | | | | | | | | | | | |
| END23 | 004476 | 1291 | 1305# | | | | | | | | | | | |
| END24 | 004622 | 1346# | | | | | | | | | | | | |
| END25 | 005030 | 1371 | 1378 | 1408* | | | | | | | | | | |
| END26 | 005152 | 1435 | 1449# | | | | | | | | | | | |
| END27 | 005364 | 1475 | 1511# | | | | | | | | | | | |
| END3 | 001474 | 565# | | | | | | | | | | | | |
| END30 | 005512 | 1552# | | | | | | | | | | | | |
| END31 | 005640 | 1593# | | | | | | | | | | | | |
| END32 | 005766 | 1634# | | | | | | | | | | | | |
| END33 | 006114 | 1675# | | | | | | | | | | | | |
| END34 | 006236 | 1716# | | | | | | | | | | | | |
| END35 | 006364 | 1757# | | | | | | | | | | | | |
| END36 | 006506 | 1798# | | | | | | | | | | | | |
| END37 | 006630 | 1839# | | | | | | | | | | | | |
| END4 | 001614 | 592 | 606# | | | | | | | | | | | |
| END40 | 006752 | 1866 | 1880# | | | | | | | | | | | |
| END41 | 007160 | 1905 | 1912 | 1942# | | | | | | | | | | |

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END42   007304          1983#
END43   007514          2009    2045#
END44   007636          2072    2086#
END45   010050          2112    2148#
END46   010176          2189#
END47   010410          2215    2251#
END5    001734           633     647#
END50   010532          2278    2292#
END51   010736          2317    2324    2354#
END52   011062          2395#
END53   011274          2421    2457#
END54   011416          2498#
END55   011624          2523    2530    2560#
END56   011764          2608#
END57   012124          2656#
END6    002062           688#
END60   012264          2704#
END61   012424          2752#
END62   012634          2807#
END66   014214          3066    3102#
END67   014360          3125    3145#
END7    002210           729#
END70   014732          3198    3233#
END71   015266          3283    3318#
END72   015622          3368    3403#
ERRORS  001002           429#   3591#
ERRORS  016722          3600    3612#
ERR1$   016740          3615#   3620
FADD  = 075000           372#
FDIV  = 075030           372#
FISLVL  000652           422#   3479*   3523*   3566*
FISVEC  000650           421#   3478*   3522*   3565*
FMUL  = 075020           372#
FSUB  = 075010           372#
HLT   = 104000           373#    469     473     477     481     485     510     514     518     522     526     551     555
                         559     563     567     591     596     600     604     608     632     637     641     645     649
                         674     678     682     686     690     715     719     723     727     731     756     760     764
                         768     772     795     802     806     810     814     818     822     826     830     834     859
                         863     867     871     875     896     904     909     913     917     921     925     929     933
                         937     961     966     970     974     978    1002    1007    1011    1015    1019    1042    1049
                        1053    1057    1061    1065    1069    1073    1077    1081    1106    1110    1114    1118    1122
                        1143    1151    1156    1160    1164    1168    1172    1176    1180    1184    1209    1213    1217
                        1221    1225    1250    1254    1258    1262    1266    1290    1295    1299    1303    1307    1332
                        1336    1340    1344    1348    1369    1377    1382    1386    1390    1394    1398    1402    1406
                        1410    1434    1439    1443    1447    1451    1474    1481    1485    1489    1493    1497    1501
                        1505    1509    1513    1538    1542    1546    1550    1554    1579    1583    1587    1591    1595
                        1620    1624    1628    1632    1636    1661    1665    1669    1673    1677    1702    1706    1710
                        1714    1718    1743    1747    1751    1755    1759    1784    1788    1792    1796    1800    1825
                        1829    1833    1837    1841    1865    1870    1874    1878    1882    1903    1911    1916    1920
                        1924    1928    1932    1936    1940    1944    1969    1973    1977    1981    1985    2008    2015
                        2019    2023    2027    2031    2035    2039    2043    2047    2071    2076    2080    2084    2088
                        2111    2118    2122    2126    2130    2134    2138    2142    2146    2150    2175    2179    2183
                        2197    2191    2214    2221    2225    2229    2233    2237    2241    2245    2249    2253    2277
                        2282    2286    2290    2294    2315    2323    2328    2332    2336    2340    2344    2349    2352
                        2356    2381    2385    2389    2393    2397    2420    2427    2431    2435    2439    2443    2447
                        2451    2455    2459    2484    2488    2492    2496    2500    2521    2529    2534    2538    2542
```

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                        2546    2550    2554    2558    2562    2590    2594    2598    2602    2606    2610    2638    2642
                        2646    2650    2654    2658    2686    2690    2694    2698    2702    2706    2734    2738    2742
                        2746    2750    2754    2793    2797    2801    2805    2809    2837    2852    2856    2860    2864
                        2868    2872    2879    2908    2925    2929    2933    2937    2941    2945    2949    2953    2960
                        2989    3006    3010    3014    3018    3022    3026    3030    3034    3041    3065    3072    3076
                        3080    3084    3088    3092    3096    3100    3104    3124    3131    3135    3139    3143    3147
                        3197    3203    3207    3211    3215    3219    3223    3227    3231    3235    3282    3288    3292
                        3296    3300    3304    3308    3312    3316    3320    3367    3373    3377    3381    3385    3389
                        3393    3397    3401    3405    3585
HLTADS  016720          3595*   3596*   3597    3610*   3612
HLTS    016600           439    3588#
ICNT    001000           428#    444#    483     524     565     606     647     688     729     770     832     873     935
                         976    1017    1079    1120    1182    1223    1264    1305    1346    1408    1449    1511    1552
                        1593    1634    1675    1716    1757    1798    1839    1880    1942    1983    2045    2086    2148
                        2189    2251    2292    2354    2395    2457    2498    2560    2608    2656    2704    2752    2807
                        2877    2958    3039    3102    3145    3203    3318    3403    3442    3448    3450    3452*   3453*
                        3455    3458*   3459    3607*
ILLUP   017272          3657    3689#
ISA13   002766           902     907#
ISA20   003774          1149    1154#
ISA25   004722          1375    1380#
ISA41   007052          1909    1914#
ISA51   010632          2321    2326#
ISA55   011516          2527    2532#
ISA70   014612          3194    3200#
ISA71   015144          3279    3285#
ISA72   015500          3364    3370#
ISR11   002416           787     798#
ISR13   002744           890     900#
ISR16   003416          1034    1045#
ISR20   003752          1137    1147#
ISR25   004700          1363    1373#
ISR27   005234          1466    1477#
ISR41   007030          1897    1907#
ISR43   007366          2000    2011#
ISR45   007720          2103    2114#
ISR47   010260          2206    2217#
ISR51   010610          2309    2319#
ISR53   011144          2412    2423#
ISR55   011474          2515    2525#
ISR66   014064          3051    3068#
ISR67   014300          3114    3127#
ISR70   014514          3161    3179#
ISR71   015046          3246    3264#
ISR72   015402          3331    3349#
KITS    016100          3445    3451    3458#   3608
LADS    016126           445*   3164*   3249*   3334*   3454*   3460    3462    3465#
N       = 000073         372#    448     489#    530#    571#    612#    653#    694#    735#    776#    838#    879#    941#
                         982#   1023#   1085#   1126#   1188#   1229#   1270#   1311#   1352#   1414#   1455#   1517#   1558#
                        1599#   1640#   1681#   1722#   1763#   1804#   1845#   1886#   1948#   1989#   2051#   2092#   2154#
                        2195#   2257#   2298#   2360#   2401#   2463#   2504#   2566#   2614#   2662#   2710#   2758#   2782
                        2812#   2883#   2964#   3045#   3108#   3151#   3154    3239#   3324#   3409#
OVERS   016104          3443    3459#
PASSES  001004           430#   3433*   3434*
PC      =%000007         387#    465*    506*    547*    587*    628*    670*    711*    752*    855*    957*    998*   1102*
                        1205*   1246*   1286*   1328*   1430*   1534*   1575*   1616*   1657*   1698*   1739*   1780*   1821*
```

DBKEAB.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
R3      =%000003        382*  788*  791*  794   799  1467* 1470* 1473  1478  1529* 1532* 1535  1816*
                       1819* 1822  2475* 2478* 2481 3614* 3616  3663  3676*
R4      =%000004        383*  850*  853*  856   1097* 1100* 1103  1323* 1326*  1329  1693* 1696* 1699
                       2207* 2210* 2213  2218  2767* 2768* 2769* 2770* 2771*  2772* 2773* 2774* 2775*
                       2776* 2777* 2781* 2782* 2783* 2784* 2788  2789  2790   3257* 3260* 3261  3285
                       3488* 3492  3501* 3512  3516* 3517* 3518* 3519* 3520*  3558* 3559* 3560* 3561*
                       3562* 3628  3629* 3647  3652* 3664  3675*
R5      =%000005        384*  455*  496*  537*  578*  619*  660*  665*  668*  671   701*  742*  747*
                        750*  753   783*  845*  886*  948*  989*  1030* 1092* 1133* 1195* 1236* 1277*
                       1318* 1359* 1421* 1462* 1524* 1585* 1606* 1611* 1614* 1617  1647* 1688* 1729*
                       1770* 1775* 1778* 1781  1811* 1852* 1893* 1955* 1996* 2058* 2099* 2104* 2107*
                       2110  2115  2161* 2202* 2264* 2305* 2367* 2408* 2470* 2511* 2573* 2621* 2669*
                       2717* 3053* 3117* 3120* 3123  3128  3167* 3252* 3337* 3471* 3472  3473  3474
                       3475  3476* 3477  3478  3479  3480  3517  3518  3519  3520  3521  3522  3523
                       3524* 3558  3559  3560  3561  3562  3564  3565  3566  3567* 3665  3674*
SAVRTS  016464         3543* 3554*
SAVTPS  017300         3659* 3683  3693*
SCOPE = 104400          372*  447   487   528   569   610   651   692   733   774   836   877   939
                        980  1021  1083  1124  1186  1227  1268  1309  1350  1412  1453  1515  1556
                       1597  1638  1679  1720  1761  1802  1843  1884  1946  1987  2049  2090  2152
                       2193  2255  2296  2358  2399  2461  2502  2564  2612  2660  2708  2756  2811
                       2881  2962  3043  3106  3149  3237  3322  3407
SCOPE$  015774          441  3440*
SP      =%000006        385*  433*  585*  588   590*  626*  629   631*  893*  897*  901   903*  955*
                        958   960*  996*  999  1001* 1140* 1144* 1148  1150* 1284* 1287  1289* 1366*
                       1370* 13 1  1376* 1428* 1431  1433* 1859* 1862  1864* 1900* 1904* 1908  1910*
                       2065* 2068  2070* 2271* 2274  2276* 2312* 2316* 2320  2322* 2518* 2522* 2526
                       2528* 2826* 2827* 2829* 2832* 2835  2836* 2842  2843  2844* 2874* 2875* 2897*
                       2898* 2900* 2903* 2906  2907* 2913  2914* 2955* 2956* 2978* 2979* 2981* 2984*
                       2987  29 8* 2994  29 5* 3036* 3037* 3179  3181  3190  3193  3195  3196* 3264
                       3266  3275  3278  3280  3281* 3349  3351  3360  3363  3365  3366* 3470  3472*
                       3473* 3474* 3475* 3488  3489  3490  3491  3501  3502  3503  3505* 3507  3508
                       3509  3510  3511  3543  3544  3545  3547* 3574  3666  3670*
SPACE   017431         3599  3618  3722*
STACK0  000630          413*  419   460   501   542   665   706   747   788   804   850  1035  1051
                       1097  1200  1241  1323  1467  1483  1529  1570  1611  1652  1693  1734  1775
                       1816  1960  20 1  2017  2104  2120  2166  2207  2223  2372  2413  2429  2475
                       3172  3205  3257  3290  3342  3375  3516  3549
STACK1= 000631          419*  3053  3058  3063  3074  3086
STACK2  000632          414*  3550
STACK4  000634          415*  471   512   553   676   717   758   861  1108  1211  1252  1334  1540
                       1581  1622  1663  1704  1745  1786  1827  1971  2177  2383  2486  3532  3551
STACK6  000636          416*  3533  3552
STACK8  000640          417*  2767  2795
STK56   011670         2574  2582*
STK57   012030         2622  2630*
STK60   012170         2670  2678*
STK61   012330         2718  2726*
SVLADS  016060         3447  3453*  3461
SWR     = 177570        376*  377   3414  3418  3440  3442  3444  3446  3588  3592  3601  3604
SW08    = 000400        351   395*  3440
SW09    = 001000        352   394*  3604
SW10    = 002000        353   393*  3414  3588
SW11    = 004000        355   392*  3446
SW12    = 010000        356   391*  3415  3417  3418
SW13    = 020000        357   390*  3592
```

```
SW14  = 040000            358     389#   3444
SW15  = 100000            359     388#
TIMES   016130            446*   3153*   3409*   3450    3466#
TPB     000656            425#   3166*   3183*   3251*   3268*   3336*   3353*   3686*
TPS     000654            424#   3165*   3192*   3250*   3277*   3335*   3362*   3659    3685*
TRAPER  016574            459     500     541     582     623     664     705     746     849     952     993    1096    1199
                         1240    1281    1322    1425    1528    1569    1610    1651    1692    1733    1774    1815    1856
                         1959    2062    2165    2268    2371    2474    2578    2626    2674    2722    3057    3171    3256
                         3341    3585#
TSA14   003156            959     964#
TSA15   003276           1000    1005#
TSA23   004440           1288    1293#
TSA26   005114           1432    1437#
TSA4    001560            589     594#
TSA40   006714           1863    1868#
TSA44   007600           2069    2074#
TSA5    001700            630     635#
TSA50   010474           2275    2280#
TST1    001120            455#
TST10   002224            742#
TST11   002350            783#
TST12   002556            845#
TST13   002702            886#
TST14   003106            948#
TST15   003226            989#
TST16   003350           1030#
TST17   003562           1092#
TST2    001242            496#
TST20   003710           1133#
TST21   004116           1195#
TST22   004244           1236#
TST23   004370           1277#
TST24   004512           1318#
TST25   004636           1359#
TST26   005044           1421#
TST27   005166           1462#
TST3    001366            537#
TST30   005400           1524#
TST31   005526           1565#
TST32   005654           1606#
TST33   006002           1647#
TST34   006130           1688#
TST35   006252           1729#
TST36   006400           1770#
TST37   006522           1811#
TST4    001510            578#
TST40   006644           1852#
TST41   006766           1893#
TST42   007174           1955#
TST43   007320           1996#
TST44   007530           2058#
TST45   007652           2099#
TST46   010064           2161#
TST47   010212           2202#
TST5    001630            619#
TST50   010424           2264#
```

```
TST51   010546          2305#
TST52   010752          2367#
TST53   011076          2408#
TST54   011310          2470#
TST55   011432          2511#
TST56   011640          2573#
TST57   012000          2621#
TST6    001750           660#
TST60   012140          2669#
TST61   012300          2717#
TST62   012440          2767#
TST63   012650          2818#
TST64   013134          2889#
TST65   013456          2970#
TST66   014002          3051#
TST67   014230          3114#
TST7    002076           701#
TST70   014414          3161#
TST71   014746          3246#
TST72   015302          3331#
TTY    =%000005          385#  3597#  3616#  3633#  3635#  3637#  3699  3700#  3701  3703  3704#  3705  3707
                        3715#  3716#  3717  3718#
TYPCNT  016762          3612#  3613#  3619#  3623#
TYPE   = 000004          374#  3163   3248   3333   3416   3590   3594  3599   3618  3651  3682
YESRT   015772           434   3439#
$PSW    000600          403#   467    508    549    594    635    672   713    754   800   857   907   964
                        1005   1047   1104   1154   1207   1248   1293  1330   1380  1437  1479  1536  1577
                        1618   1659   1700   1741   1782   1823   1868  1914   1967  2013  2074  2116  2173
                        2219   2280   2326   2379   2425   2482   2532  2588   2636  2684  2732  2786* 2787*
                        2791   2834*  2841*  2850   2905*  2912*  2923  2986*  2993*  3004  3070  3122* 3129
                        3189*  3201   3274*  3286   3359*  3371   3486* 3487*  3500*  3530* 3531* 3542* 3572*
                        3573*  3614
$SP     000602          404#   466*   471    507*   512    548*   553   671*   676   712*  717   753*  758
                        794*   799*   804    856*   861    1041*  1046* 1051   1103*  1108  1206* 1211  1247*
                        1252   1329*  1334   1473*  1478*  1483   1535* 1540   1576*  1581  1617* 1622  1658*
                        1663   1699*  1704   1740*  1745   1781*  1786  1822*  1827  1966* 1971  2007* 2012*
                        2017   2110*  2115*  2120   2172*  2177   2213* 2218*  2223  2378* 2383  2419* 2424*
                        2429   2481*  2486   2490*  2795   2835*  2842* 2854   2906*  2913* 2927  2987* 2994*
                        3008   3064*  3069*  3074   3123*  3128*  3133  3195*  3200*  3205  3280* 3285* 3290
                        3365*  3370*  3375   3491*  3511*  3578*
.       = 017442         396#   397    398#   402#   427#   468    472   476    480   484   509   513   517
                         521   525    550    554    558    562    566   595    599   603   607   636   640
                         644   648    673    677    681    685    689   714    718   722   726   730   755
                         759   763    767    771    801    805    809   813    817   821   825   829   833
                         858   862    866    870    874    908    912   916    920   924   928   932   936
                         965   969    973    977    1006   1010   1014  1018   1048  1052  1056  1060  1064
                        1068   1072   1076   1080   1105   1109   1113  1117   1121  1155  1159  1163  1167
                        1171   1175   1179   1183   1208   1212   1216  1220   1224  1249  1253  1257  1261
                        1265   1294   1298   1302   1306   1331   1335  1339   1343  1347  1381  1385  1389
                        1393   1397   1401   1405   1409   1438   1442  1446   1450  1480  1484  1488  1492
                        1496   1500   1504   1508   1512   1537   1541  1545   1549  1553  1578  1582  1586
                        1590   1594   1619   1623   1627   1631   1635  1660   1664  1668  1672  1676  1701
                        1705   1709   1713   1717   1742   1746   1750  1754   1758  1783  1787  1791  1795
                        1799   1824   1828   1832   1836   1840   1869  1873   1877  1881  1915  1919  1923
                        1927   1931   1935   1939   1943   1968   1972  1976   1980  1984  2014  2018  2022
                        2026   2030   2034   2038   2042   2046   2075  2079   2083  2087  2117  2121  2125
```

DBKEAB.P11  CROSS REFERENCE TABLE -- USER SYMBOLS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DUMP | 343# | 3597 | 3615 | | | | | |
| POP | 343# | 3674 | | | | | | |
| PRINT | 343# | | | | | | | |
| PUSH | 343# | 3660 | | | | | | |
| SDUMP | 343# | | | | | | | |
| $ADDER | 448# | 776 | 1023 | | | | | |
| $ADDES | 448# | 879 | 1126 | | | | | |
| $ADDR | 448# | 489 | 530 | 653 | 694 | 735 | 838 | 1085 |
| $ADDS | 448# | 571 | 612 | 941 | 982 | | | |
| $ADRER | 448# | 3045 | 3108 | | | | | |
| $ALL | 448# | 2758 | | | | | | |
| $ALL2 | 448# | 2782 | | | | | | |
| $CATCH | 343# | 396 | | | | | | |
| $DIVER | 448# | 2092 | 2195 | 2401 | | | | |
| $DIVES | 448# | 2298 | 2504 | | | | | |
| $DIVR | 448# | 2154 | 2360 | 2463 | | | | |
| $DIVS | 448# | 2051 | 2257 | | | | | |
| $END | 343# | 3413 | | | | | | |
| $EQUAT | 343# | 372 | | | | | | |
| $FINT | 448# | 3154 | 3239 | 3324 | | | | |
| $FIS7 | 448# | 2566 | 2614 | 2662 | 2710 | | | |
| $HLT | 343# | 3588 | | | | | | |
| $MULER | 448# | 1989 | | | | | | |
| $MULES | 448# | 1886 | | | | | | |
| $MULR | 448# | 1681 | 1722 | 1763 | 1804 | 1948 | | |
| $MULS | 448# | 1845 | | | | | | |
| $OCTAL | 343# | 3624 | | | | | | |
| $SCOPE | 343# | 3440 | | | | | | |
| $SLRED | 448# | 2883 | 2964 | | | | | |
| $SLRYE | 448# | 2812 | | | | | | |
| $SUBER | 448# | 1455 | | | | | | |
| $SUBES | 448# | 1352 | | | | | | |
| $SUBR | 448# | 1188 | 1229 | 1311 | 1517 | 1558 | 1599 | 1640 |
| $SUBS | 448# | 1270 | 1414 | | | | | |
| $SWDOC | 343# | 348 | | | | | | |
| $TYPE | 343# | 3699 | | | | | | |

```
ADC     3434
ADD     3433  3471  3476  3712  3715
BEQ      468   472   476   480   484   509   513   517   521   525   550   554   558   562   566
         589   595   599   603   607   630   636   640   644   648   673   677   681   685   689
         714   718   722   726   730   755   759   763   767   771   801   805   809   813   817
         821   825   829   833   858   862   866   870   874   902   908   912   916   920   924
         928   932   936   959   965   969   973   977  1000  1006  1010  1014  1018  1048  1052
        1056  1060  1064  1068  1072  1076  1080  1105  1109  1113  1117  1121  1149  1155  1159
        1163  1167  1171  1175  1179  1183  1208  1212  1216  1220  1224  1249  1253  1257  1261
        1265  1288  1294  1298  1302  1306  1331  1335  1339  1343  1347  1375  1381  1385  1389
        1393  1397  1401  1405  1409  1432  1438  1442  1446  1450  1480  1484  1488  1492  1496
        1500  1504  1508  1512  1537  1541  1545  1549  1553  1578  1582  1586  1590  1594  1619
        1623  1627  1631  1635  1660  1664  1668  1672  1676  1701  1705  1709  1713  1717  1742
        1746  1750  1754  1758  1783  1787  1791  1795  1799  1824  1828  1832  1836  1840  1863
        1869  1873  1877  1881  1909  1915  1919  1923  1927  1931  1935  1939  1943  1968  1972
        1976  1980  1984  2014  2018  2022  2026  2030  2034  2038  2042  2046  2069  2075  2079
        2083  2087  2117  2121  2125  2129  2133  2137  2141  2145  2149  2174  2178  2182  2186
        2190  2220  2224  2228  2232  2236  2240  2244  2248  2252  2275  2281  2285  2289  2293
        2321  2327  2331  2335  2339  2343  2347  2351  2355  2380  2384  2388  2392  2396  2426
        2430  2434  2438  2442  2446  2450  2454  2458  2483  2487  2491  2495  2499  2527  2533
        2537  2541  2545  2549  2553  2557  2561  2589  2593  2597  2601  2605  2609  2637  2641
        2645  2649  2653  2657  2685  2689  2693  2697  2701  2705  2733  2737  2741  2745  2749
        2753  2792  2796  2800  2804  2808  2851  2855  2859  2863  2867  2871  2878  2924  2928
        2932  2936  2940  2944  2948  2952  2959  3005  3009  3013  3017  3021  3025  3029  3033
        3040  3071  3075  3079  3083  3087  3091  3095  3099  3103  3130  3134  3138  3142  3146
        3180  3182  3194  3202  3206  3210  3214  3218  3222  3226  3230  3234  3265  3267  3279
        3287  3291  3295  3299  3303  3307  3311  3315  3319  3350  3352  3364  3372  3376  3380
        3384  3388  3392  3396  3400  3404  3428  3441  3443  3449  3461  3589  3640  3643  3684
        3706
BIC     2787  3487  3504  3531  3546  3563  3573  3716
BIS     3422  3564
BISB    3644
BIT     3414  3418  3440  3444  3446  3588  3592  3604  3683  3701
BNE     3415  3419  3445  3447  3451  3593  3605  3646  3648  3673  3702  3714
BPL     3421  3602  3620  3709
BR       592   633   796   898   905   962  1003  1043  1145  1152  1291  1371  1378  1435  1475
        1866  1905  1912  2009  2072  2112  2215  2278  2317  2324  2421  2523  2530  2839  2910
        2991  3066  3125  3177  3187  3198  3262  3272  3283  3347  3357  3368  3625  3631  3690
        3710
CLR      444   445  3152  3192  3277  3362  3411  3417  3626  3671
CLRB    3607  3630  3632  3650
CMP      467   471   508   512   516   549   553   588   594   598   629   635   639   672   676
         680   684   713   717   721   725   754   758   762   804   808   812   816   820   824
         857   861   865   901   907   911   915   919   923   927   958   964   968   999  1005
        1009  1013  1047  1051  1055  1059  1063  1067  1071  1075  1104  1108  1112  1116  1148
        1154  1158  1162  1166  1170  1174  1178  1207  1211  1215  1219  1248  1252  1256  1287
        1293  1297  1301  1330  1334  1338  1374  1380  1384  1388  1392  1396  1400  1404  1431
        1437  1441  1445  1479  1483  1487  1491  1495  1499  1503  1507  1536  1540  1544  1548
        1577  1581  1585  1589  1618  1622  1626  1630  1659  1663  1667  1671  1700  1704  1741
        1745  1749  1753  1782  1786  1823  1827  1862  1868  1872  1876  1908  1914  1918  1922
        1926  1930  1934  1938  1967  1971  1975  2013  2017  2021  2025  2029  2037  2041  2068
        2074  2078  2082  2116  2120  2124  2128  2132  2136  2140  2144  2173  2177  2181  2185
        2219  2223  2227  2231  2235  2239  2243  2247  2274  2280  2284  2288  2320  2326  2330
        2334  2338  2342  2346  2379  2383  2387  2425  2429  2433  2437  2441  2445  2449  2453
        2482  2486  2526  2532  2536  2540  2544  2548  2552  2556  2588  2592  2596  2600  2636
        2640  2644  2648  2684  2688  2692  2696  2732  2736  2740  2744  2791  2795  2799  2803
```

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2850 | 2854 | 2858 | 2862 | 2866 | 2870 | 2923 | 2931 | 2935 | 2939 | 2943 | 2947 | 3004 | 3012 | 3016 |
| | 3020 | 3024 | 3028 | 3032 | 3070 | 3074 | 3078 | 3082 | 3086 | 3090 | 3094 | 3098 | 3129 | 3133 | 3137 |
| | 3141 | 3176 | 3179 | 3181 | 3190 | 3193 | 3201 | 3205 | 3209 | 3213 | 3225 | 3229 | 3261 | 3264 | 3266 |
| | 3275 | 3278 | 3286 | 3290 | 3294 | 3298 | 3302 | 3310 | 3314 | 3346 | 3349 | 3351 | 3360 | 3363 | 3371 |
| | 3375 | 3379 | 3383 | 3387 | 3395 | 3399 | 3647 | 3713 | | | | | | | |
| CMPB | 483 | 524 | 565 | 606 | 647 | 688 | 729 | 770 | 832 | 873 | 935 | 976 | 1017 | 1079 | 1120 |
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