FP11

DIVIDE EXERCISER

MD-11-DCFPU-D

EP-DCFPU-D-DL-A

OCT 1976

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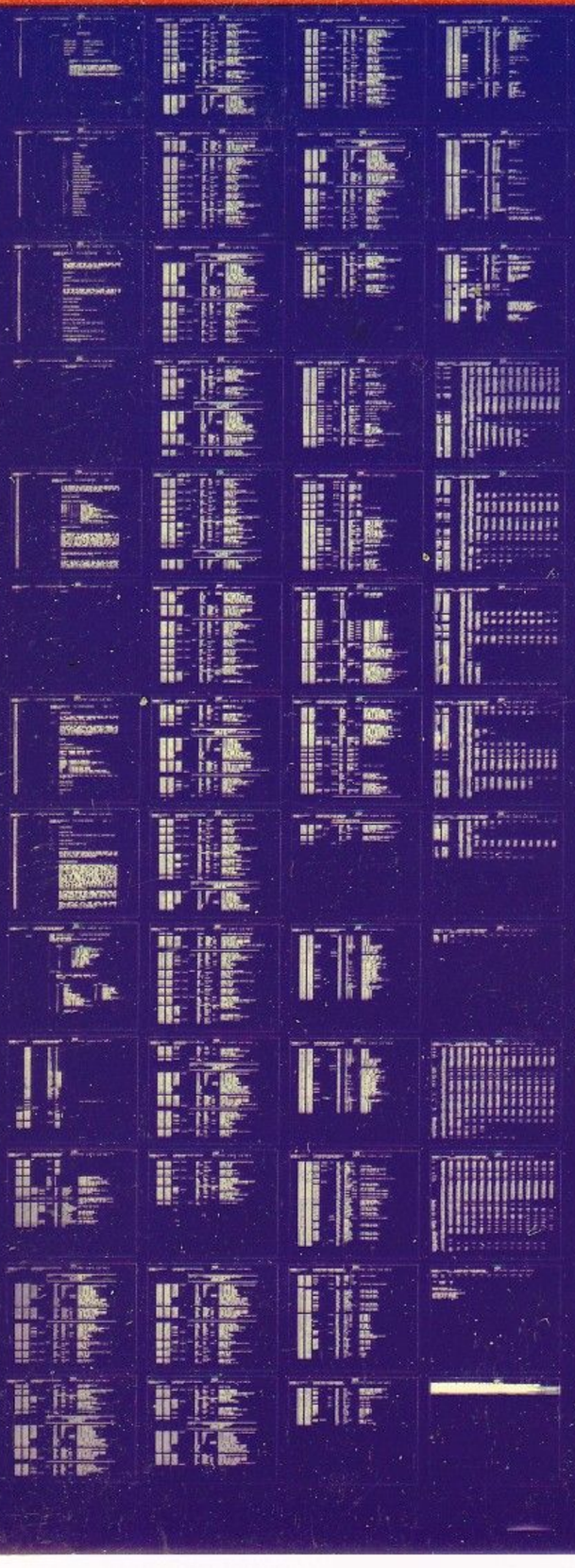
Made in U.S.A.



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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DCFPU-C-D

PRODUCT NAME: FP11 DIVIDE EXERCISER

DATE CREATED: 1-NOV-72

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: KEN CHAPMAN

CONTENTS

DESCRIPTION

1. ABSTRACT

THIS PROGRAM EXERCISES THE FP11 FLOATING POINT DIVIDE INSTRUCTIONS (DIVF AND DIVD) WITH RANDOM NUMBER PATTERNS. THE ANSWERS ARE CHECKED AGAINST RESULTS OBTAINED USING THE CORRESPONDING FORTRAN SOFTWARE ROUTINES.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP11 45 STANDARD COMPUTER WITH FP11 OPTION

2.2 STORAGE

THE ROUTINES USE MEMORY LOCATIONS 0 - 17500. THE MAP AT THE END OF THE LISTINGS SHOWS THE ABSOLUTE LOCATIONS OF THE FORTRAN MATH ROUTINES WHICH WERE ASSEMBLED SEPERATELY AND LINKED TO THE MAIN PROGRAM VIA LNK11 ON A DECSYSTEM-10.

2.3 PRELIMINARY PROGRAMS

DCFPA THRU DCFPL

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

1. LOAD PROGRAM INTO MEMORY USING ABS LOADER.
2. LOAD ADDRESS 200.

[illegible] 3; SEE SWITCHES SEE 5.1.1 ALL CODE FOR WORST CASE.
4; PRESS G-GO.

5) THE PROGRAM WILL LOOP AND BELL WILL RING ONCE EVERY PASS.
6) THE DISPLAY ON THE 11/45 WILL SHOW THE ITERATION COUNT ON THE LEFT BYTE AND TEST NUMBER IN THE RIGHT. TO SEE, SET THE DATA DISPLAY SWITCH TO THE DISPLAY POSITION.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

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 ..... CORE IMAGE TYPE-OUT (16 BIT WORDS
0 ..... FLOATING POINT TYPE-OUT (SIGN, EXPONENT, MANTISSA)
SW(08) = 1 ..... LOOP ON TEST IN SW(7:0)
0 ..... LOAD SW(7:0) INTO LSB REGISTER

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST IN THE TEST SECTION. IT RECORDS THE STARTING ADDRESS OF EACH SUBTEST AS IT IS BEING ENTERED IN LOCATION "LAD". 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 LAD MAY BE USED TO DETERMINE THE LAST SUBTEST SUCCESSFULLY COMPLETED. LAD IS UPDATED INSIDE EACH SUBTEST AFTER THE FORTRAN ANSWER IS CALCULATED, SO THE FIRST ITERATIONS WILL INCLUDE ONLY THE FP11 PORTION OF THE TEST.

5.2.2 HLT

THIS ROUTINE PRINTS OUT AN ERROR MESSAGE (SEE 5.3). TO INHIBIT TYPEOUTS, PUT SW(13) ON A 1.

5.2.3 TRTRAP

IF SW(12) IS ON A 0, THE T BIT WILL BE SET ON ALTERNATE PASSES. WHEN SET, IT CAUSES A TRAP 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

199 REACHED.

5.2.4 TRAPCATCHER

A ".+2" - "HALT" SEQUENCE IS REPEATED FROM 0 - 776 TO CATCH ANY UNEXPECTED TRAPS. THUS ANY UNEXPECTED TRAPS OR INTERRUPTS WILL HALT AT THE VECTOR + 2.

5.2.5 FLOATING POINT TRAP (TO 244)

SINCE SOME OF THE SUBTESTS HAVE INTERRUPTS ENABLED, THE FLOATING POINT TRAP (FLTERR) CHECKS TO SEE IF FORTRAN ALSO GOT AN ERROR CONDITION. IF FORTRAN DIDN'T INDICATE AN ERROR, OR INTERRUPTS WERE DISABLED AN ERROR MAY OCCUR. (SEE 5.2.2). IF AN INTERRUPT WAS ANTICIPATED, BUT DIDN'T OCCUR, THE SUBTEST WILL DETECT THE ERROR.

6. ERRORS

6.1 ERROR PRINTOUT

THE FORMAT IS AS FOLLOWS:

ADDRESS, OPERAND, OPERATOR, OPERAND, EQUALS
FPP: ANSWER, FPS, FEC, FEA
FORTRAN: ANSWER, FPS, FEC, FEA

WHERE:

ADDRESS = ADDRESS OF ERROR HLT
OPERAND = RANDOM FLOATING POINT NUMBER INPUTS
OPERATOR = ARITHMETIC OPERATOR (+ OR -)
EQUALS   = (=)
ANSWER   = FLOATING POINT ANSWER
FPS   = FLOATING POINT STATUS
FEC   = FLOATING EXCEPTION CODES (ERROR CODES)
FEA   = FLOATING EXCEPTION ADDRESS (ERROR ADDRESS

TO FIND THE FAILING TEST, LOOK AT THE LISTING ABOVE THE ADDRESS TYPED.

6.2 ERROR RECOVERY

RESTART AT 200

7. RESTRICTIONS

NONE

DESCRIPTION

8. MISCELLANEOUS

8.1 EXECUTION TIME

A BELL WILL RING WITHIN 15 SECONDS WITH ALL SWITCHES DOWN.

8.2 STACK POINTER

STACK IS INITALLY SET TO 600

8.3 POWER FAIL

EACH TEST CAN BE POWER FAILED WITH NO ERRORS EXCEPT ON THE FEC AND FEA. TO USE, START THE TEST AS USUAL AND POWER DOWN THEN UP AT ANY TIME. THE PROGRAM SHOULD TYPE "POWER" AND CONTINUE TO RUN WITH NO OTHER TYPEOUTS.

9. PROGRAM DESCRIPTION

THIS PROGRAM TESTS THE DIVIDE INSTRUCTIONS ON THE FP11 IN ROUND AND TRUNCATE MODES AND WITH INTERUPTS ON AND OFF. EACH PROGRAM HAS MANY SUBTESTS (THE CODE BETWEEN 2 SCOPE STATEMENTS) WHICH ARE RUN 256 TIMES BEFORE CONTINUING TO THE NEXT. SW(11) ON A 1 CAUSES EACH SUBTEST TO BE RUN ONLY ONCE. THE ADDRESS ICNT (LOC 1000) AND DISPLAY REGISTER ON THE 11/45 EACH CONTAIN 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.

THE FORTRAN MATH ROUTINES WERE TAKEN UNMODIFIED FROM THE PDP-11 FORTRAN PACKAGE AND ASSEMBLED AS SEPERATE MODULES. THEY WERE LINKED TO THE MAIN PROGRAMS VIA LNKX11 ON A DECSYSTEM-10 WHICH PRODUCES A BINARY TAPE IN THE NORMAL ABSOLUTE FORMAT. THUS, THE PROGRAMS LOAD AND RUN JUST LIKE ANY OTHER DIAGNOSTIC PROGRAM.

NOTE: SINCE THE FP11 LOAD, STORE, AND COMPARE INSTRUCTIONS (LDF, LDD, STF, STD, CMPF, AND CMPD ARE ALSO USED IN THIS PROGRAM, IT IS POSSIBLE THAT THEY AND NOT THE DIVIDE INSTRUCTIONS COULD CAUSE ERRORS.

.END

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000000                  .TITLE  MAINDEC-11-DCFPU-D      FLOATING POINT DIVIDE EXERCISER
                        .ASECT
                        .GLOBL  $DVR,$DVD,$ERRA
                        ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS
                        ;PROGRAM BY KEN CHAPMAN

                        ;       SWITCH          USE
                        ;       ------          --------------------
                        ;          8            0 - LOAD UB REGISTER WITH SW(7:0)
                        ;                       1 - LOOP ON TEST IN SW(7:0)
                        ;          9            TTY OUTPUT FORMAT:
                        ;                       0 - SIGN, EXPONENT, MANTISSA
                        ;                       1 - CORE IMAGE (16 BIT WORDS)
                        ;         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

                        ;OUTPUT FORM:
                        ;ADDRESS, OPERAND, OPERATOR, OPERAND, EQUALS
                        ;FPP:            ANSWER, FPS, FEC, FEA
                        ;FORTRAN:

                        ;       FPS                                     FEC
                        ;BIT    REASON                          CODE    ERROR
                        ;---    ------                          ----    -----
                        ;  0    CARRY                             0     ADDRESS ERROR
                        ;  1    OVERFLOW                          2     OPCODE ERROR
                        ;  2    ZERO                              4     DIVIDE BY ZERO
                        ;  3    NEGATIVE                          6     CONVERSION ERROR
                        ;  4    MAINTAINANCE MODE                10     OVERFLOW
                        ;  5    TRUNCATE MODE                    12     UNDERFLOW
                        ;  6    LONG INTEGER MODE                14     UNDEFINED VARIABLE (-C
                        ;  7    DOUBLE PRECISION MODE            16     UBREAK TRAP
                        ;  8    INTERUPT ON CONVERSION ERROR
                        ;  9    INTERUPT ON OVERFLOW
                        ; 10    INTERUPT ON UNDERFLOW
                        ; 11    INTERUPT ON UNDEFINED VARIABLE
                        ; 12
                        ; 13
                        ; 14    INTERUPT ENABLE
                        ; 15    ERROR FLAG
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MKINDEC-11-COFPJ-D      FLOATING POINT DIVIDE EXERCISER
CFPDV.P11               ASSIGNMENTS AND VECTOR AREA

                        R0=     %0
                        R1=     %1
                        R2=     %2
                        R3=     %3
                        R4=     %4
                        R5=     %5
                        TTY=    %5
                        SP=     %6
                        PC=     %7
                        AC0=    %0
                        AC1=    %1
                        AC2=    %2
                        AC3=    %3
                        AC4=    %4
                        AC5=    %5
000400                  SW08=   000400
001000                  SW09=   001000
002000                  SW10=   002000
004000                  SW11=   004000
010000                  SW12=   010000
020000                  SW13=   020000
040000                  SW14=   040000
100000                  SW15=   100000
177570                  SWR=    177570
177776                  PS=     177776
177570                  DISPLAY=SWR
000000                  DUMMY=  HALT
000240                  NOP=    240
104400                  SCOPE=  TRAP
104000                  HLT=    EMT
000004                  TYPE=   IOT
000207                  BELL=   207

000000                  .=      0                       ;TRAP CATCHER FROM 0 - 776

000200                  .=      200

000200  000167  000652            JMP     BEG

001000                  .=      1000
001000  000000          ICNT:   0
001002  000000          LONJM:  DUMMY
001004  000000                  DUMMY
001006  000000                  DUMMY
001010  000000                  DUMMY

001012  000000          HINUM:  DUMMY
001014  000000                  DUMMY
001016  000000                  DUMMY
001020  000000                  DUMMY
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001022  000000                  ANS1:   DUMMY
001024  000000                          DUMMY
001026  000000                          DUMMY
001030  000000                          DUMMY

001032  000000                  ANS2:   DUMMY
001034  000000                          DUMMY
001036  000000                          DUMMY
001040  000000                          DUMMY

001042  000000                  FPS:    0                       ;FLOATING POINT STATUS
001044  000000                  FEC:    0                       ;FLOATING EXCEPTION CODES
001046  000000                  FPC:    0                       ;FLOATING PC
001050  000000                  $FPS:   0                       ;FORTRAN FLOATING POINT STATUS
001052  000000                  $FEC:   0                       ;FORTRAN FLOATING EXCEPTION CODES
001054  000000                  $FPC:   0                       ;FORTRAN FLOATING PC

001056  012706  000600          BEG:    MOV     #600,SP         ;** STACK AT 600 **
001062  012737  001104  000004          MOV     #M112C,@#4      ;FIND OUT WHICH MACHINE THIS IS
001070  005737  177772                  TST     @#177772        ;IS PIRQ THERE?
001074  012767  000006  005034          MOV     #6,YESRT        ;FUDGE IN RTT IF 11/45
001102  000403                          BR      BEGIN

001104  016737  010050  000010  M112C:  MOV     FPTADR,@#10     ;LOAD THE ILLEGAL INSTRUCTION VECTOR
                                                                ; WITH THE ADDRESS OF THE FPU.
                                                                ; THE FPU WILL HANDLE THE BAD OPCODES
001112  012737  000006  000004  BEGIN:  MOV     #6,@#4          ;RESET 4
001120  012706  000600                  MOV     #600,SP
001124  012737  006136  000014          MOV     #YESRT,@#14     ;SET TRACE TRAP VECTOR
001132  012777  010606  010026          MOV     #POWDWN,@DWNVEC
001140  012777  000340  010022          MOV     #340,@DWNVEC+2
001146  012737  011006  000020          MOV     #.IOT,@#20      ;SET UP VECTOR 20
001154  012700  000030                  MOV     #30,R0          ;SET R0 TO VECTOR 30
001160  012720  007542                  MOV     #.TRP,(0)+      ;SET EMT VECTOR
001164  012720  000340                  MOV     #340,(0)+
001170  012720  006140                  MOV     #.EMT,(0)+      ;SET TRAP VECTOR
001174  012710  000340                  MOV     #340,(0)
001200  012777  007210  007754          MOV     #FLTERR,@FPVECT ;LOAD INTERUPT VECTOR
001206  012777  000340  007750          MOV     #340,@FPVECT+2  ;LOCK UP PROCESSOR
001214  005067  177560                  CLR     ICNT
001220  005067  007756                  CLR     LAD
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                        ;*****************************************************************
                        ;TEST 1:        EXERCISE DIVF (DIVIDE FLOATING)
                        ;                       ALL INTERUPTS ON
                        ;                       ROUNDING MODE
                        ;*****************************************************************

001224  104400                          SCOPE
001226  012767  007400  177514          MOV     #007400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
001234  005067  177612                  CLR     $FEC            ;CLR FORTRAN FEC
001240  005067  177610                  CLR     $FPC            ;CLR FORTRAN FPC
001244  005067  177572                  CLR     FPS             ;CLR FPU FPS BUFFER
001250  005067  177570                  CLR     FEC             ;CLR FPU FEC BUFFER
001254  005067  177566                  CLR     FPC             ;CLR FPU FPC BUFFER
001260  004767  005762                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
001264  004467  005010                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
001270  006312                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
001272  006334                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
001274  0C0000G                        $DVR                    ;ADDRESS OF FORTRAN DIVIDE
001276  006402                          $TST                    ;DETERMINE THE CONDITION CODES
001300  006346                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

001302  016700  177542                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
001306  170127  040000                  LDFPS   #040000         ;SET INTERUPT DISABLE
001312  172467  177464                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
001316  172567  177470                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
001322  172767  177504                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
001326  170127  007400                  LDFPS   #007400         ;TURN INTERUPTS ON
001332  012767  001340  007642          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

001340  172600                  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
001342  174601          RET1:   DIVF    AC1,    AC2     ;DIVIDE AC1 INTO AC2
001344  005767  177500          TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
001350  100412                  BMI     ERR1            ;BRANCH IF ERROR FLAG SET
001352  170267  177464          STFPS   FPS             ;STORE FLOATING POINT STATUS
001356  026767  177460  177464  CMP     FPS,    $FPS    ;CHECK FPS
001364  001427                  BEQ     TST1            ;BRANCH IF OK
001366  174267  177430          STF     AC2,    ANS1    ;SAVE FPU ANSWER
001372  104001                  HLT+1                   ;FPS ERROR
001374  000444                  BR      END1            ;SKIP COMPARE

001376  170000          ERR1:   CFCC                    ;WAIT FOR FPU TO FINISH
001400  026767  177436  177442  CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
001406  001402                  BEQ     .+6             ;BRANCH IF OK
001410  104377                  HLT+377                 ;FPS ERROR
001412  000435                  BR      END1            ;SKIP TO END

001414  026767  177424  177430  CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
001422  001402                  BEQ     .+6             ;BRANCH IF OK
001424  104377                  HLT+377                 ;FEC IS WRONG
001426  000427                  BR      END1            ;SKIP TO END

001430  026767  177412  177416  CMP     FPC,$FPC        ;CHECK FLOATING PC
001436  001402                  BEQ     TST1            ;BRANCH IF OK
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001440  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
001442  000421                          BR      END1            ;SKIP TO END

001444  173702          TST1:           CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
001446  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
001450  001416                          BEQ     END1            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
001452  174267  177344                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
001456  162767  000001  177340          SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
001464  005667  177332                  SBC     ANS1
001470  173767  177326                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
001474  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
001476  001403                          BEQ     END1            ;BRANCH IF OK
001500  174267  177316                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
001504  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

001506  005067  177330          END1:   CLR     FPS             ;CLR FPU FPS BUFFER
001512  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 2:        EXERCISE DIVD (DIVIDE DOUBLE PRECISION)
                        ;               ALL INTERUPTS ON
                        ;               ROUNDING MODE
                        ;*****************************************************************

001514  012767  007600  177326          MOV     #007600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
001522  005067  177324                  CLR     $FEC            ;CLR FORTRAN FEC
001526  005067  177322                  CLR     $FPC            ;CLR FORTRAN FPC
001532  005067  177304                  CLR     FPS             ;CLR FPU FPS BUFFER
001536  005067  177302                  CLR     FEC             ;CLR FPU FEC BUFFER
001542  005067  177300                  CLR     FPC             ;CLR FPU FPC BUFFER
001546  004767  005632                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
001552  004467  004522                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
001556  006302                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
001560  006324                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
001562  000000G                         $DVD                    ;ADDRESS OF FORTRAN DIVIDE
001564  006402                          $TST                    ;DETERMINE THE CONDITION CODES
001566  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

001570  016700  177254                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
001574  170127  040200                  LDFPS   #040200         ;SET FID AND FD
001600  172467  177176                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
001604  172567  177202                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
001610  172767  177216                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
001614  170127  007600                  LDFPS   #007600         ;TURN INTERUPTS ON
001620  012767  001626  007354          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

001626  172600          RET2:           LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
001630  174401                          DIVD    AC1,    AC2     ;DIVIDE AC1 INTO AC2
001632  006767  177312                  $TST    $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
001636  100416                          BMI     ERR2            ;BRANCH IF ERROR FLAG SET
001640  175401  177276                  STFPS   FPS             ;STORE FLOATING POINT STATUS
001644  026767  177272  177276          CMP     FPS,    $FPS    ;CHECK FPS
001652  001402                          BEQ     TST2            ;BRANCH IF OK
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001654  174267  177142          STD     AC2,    ANS1    ;SAVE FPU ANSWER
001660  104001                  HLT+1                   ;FPS ERROR
001662  000450                  BR      END2            ;SKIP TO END

001664  170000          ERR2:   CFCC                    ;WAIT FOR FPU TO FINISH
001666  026767  177150  177154  CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
001674  001402                  BEQ     .+6             ;BRANCH IF OK
001676  104377                  HLT+377                 ;FPS ERROR
001700  000441                  BR      END2            ;SKIP TO END

001702  026767  177136  177142  CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
001710  001402                  BEQ     .+6             ;BRANCH IF OK
001712  104377                  HLT+377                 ;FEC IS WRONG
001714  000433                  BR      END2            ;SKIP TO END

001716  026767  177124  177130  CMP     FPC,$FPC        ;CHECK FLOATING PC
001724  001402                  BEQ     TST2            ;BRANCH IF OK
001726  104377                  HLT+377                 ;WRONG ADDRESS IN FPC
001730  000425                  BR      END2            ;SKIP TO END

001732  173702          TST2:   CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
001734  170000                  CFCC                    ;COPY FLOATING CONDITION CODES
001736  001422                  BEQ     END2            ;ANSWERS CHECK
                                ;COMPENSATE FOR FORTRAN INACCURACIES.
001740  174267  177056          STD     AC2,    ANS1    ;SAVE FPU ANSWER
001744  162767  000001  177056  SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
001752  005667  177050          SBC     ANS1+4
001756  005667  177042          SBC     ANS1+2
001762  005667  177034          SBC     ANS1
001766  173767  177030          CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
001772  170000                  CFCC                    ;COPY FLOATING CONDITION CODES
001774  001403                  BEQ     END2            ;BRANCH IF OK
001776  174267  177020          STD     AC2,    ANS1    ;SAVE FPU ANSWER
002002  104000                  HLT                     ;FPU AND FORTRAN DISAGREE

002004  005067  177032  END2:   CLR     FPS             ;CLR FPU FPS BUFFER
002010  104400                  SCOPE

                        ;*****************************************************************
                        ;TEST 3:        EXERCISE DIVF (DIVIDE FLOATING)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF.
                        ;                       ROUNDING MODE
                        ;*****************************************************************

002012  012767  004400  177030  MOV     #004400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
002020  005067  177026          CLR     $FEC            ;CLR FORTRAN FEC
002024  005067  177024          CLR     $FPC            ;CLR FORTRAN FPC
002030  005067  177036          CLR     FPS             ;CLR FPU FPS BUFFER
002034  005067  177004          CLR     FEC             ;CLR FPU FEC BUFFER
002040  005067  177002          CLR     FPC             ;CLR FPU FPC BUFFER
002044  004767  005176          JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
002050  004467  004224          JSR     R4,     $POLSH  ;ENTER POLISH MODE
002054  006312                  $P.2A                   ;PUSH 2 WORDS ON STACK (LOWNUM)
002056  006334                  $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
002060  000000                  $DVR                    ;ADDRESS OF FORTRAN DIVIDE
002062  006402                  $TST                    ;DETERMINE THE CONDITION CODES
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        002064  006346                                  $POP2X                          ;POP 2 WORDS AND EXIT POLISH MODE

        002066  016700  176756                          MOV     $FPS,   R0              ;DISPLAY FLOATING POINT STATUS
        002072  170127  040000                          LDFPS   #040000                 ;SET FID
        002076  172467  176700                          LDF     LONUM,  AC0             ;LOAD AC0 WITH A RANDOM NUMBER
        002102  172567  176704                          LDF     HINUM,  AC1             ;LOAD AC1 WITH A RANDOM NUMBER
        002106  172767  176720                          LDF     ANS2,   AC3             ;LOAD AC3 WITH THE SUM
        002112  170127  004400                          LDFPS   #004400                 ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
        002116  012767  002124  007256                  MOV     #.+6,   LAD             ;RESET LOOP ADDRESS

                                        ;**************************************************************

        002124  172600                                  LDF     AC0,    AC2             ;LOAD AC0 INTO AC2
        002126  174601                          RET3:   DIVF    AC1,    AC2             ;DIVIDE AC1 INTO AC2
        002130  005767  176714                          TST     $FPS                    ;CHECK FOR FORTRAN FPS ERROR FLAG
        002134  100412                                  BMI     ERR3                    ;BRANCH IF ERROR FLAG SET
        002136  170267  176700                          STFPS   FPS                     ;STORE FLOATING POINT STATUS
        002142  026767  176674  176700                  CMP     FPS,    $FPS            ;CHECK FPS
        002150  001427                                  BEQ     TST3                    ;BRANCH IF OK
        002152  174267  176644                          STF     AC2,    ANS1            ;SAVE FPU ANSWER
        002156  104001                                  HLT+1                           ;FPS ERROR
        002160  000450                                  BR      END3                    ;SKIP COMPARE

        002162  170000                          ERR3:   CFCC                            ;WAIT FOR FPU TO FINISH
        002164  026767  176652  176656                  CMP     FPS,$FPS                ;CHECK THE FLOATING POINT STATUS
        002172  001402                                  BEQ     .+6                     ;BRANCH IF OK
        002174  104377                                  HLT+377                         ;FPS ERROR
        002176  000441                                  BR      END3                    ;SKIP TO END

        002200  026767  176640  176644                  CMP     FEC,$FEC                ;CHECK THE FLOATING EXCEPTION CODES
        002206  001402                                  BEQ     .+6                     ;BRANCH IF OK
        002210  104377                                  HLT+377                         ;FEC IS WRONG
        002212  000433                                  BR      END3                    ;SKIP TO END

        002214  026767  176626  176632                  CMP     FPC,$FPC                ;CHECK FLOATING PC
        002222  001402                                  BEQ     TST3                    ;BRANCH IF OK
        002224  104377                                  HLT+377                         ;WRONG ADDRESS IN FPC
        002226  000425                                  BR      END3                    ;SKIP TO END

        002230  032767  000002  176612          TST3:   BIT     #2,     $FPS            ;CHECK FOR OVERFLOW
        002236  001021                                  BNE     END3                    ;BRANCH IF OVERFLOW
        002240  173702                                  CMPF    AC2,    AC3             ;COMPARE FPU ANSWER TO FORTRAN ANSWER
        002242  170000                                  CFCC                            ;COPY FLOATING CONDITION CODES
        002244  001416                                  BEQ     END3                    ;ANSWERS CHECK
                                                ;COMPENSATE FOR FORTRAN INACCURACIES.
        002246  174267  176550                          STF     AC2,    ANS1            ;SAVE FPU ANSWER
        002252  162767  000001  176544                  SUB     #1,     ANS1+2          ;DECREMENT FPU ANSWER
        002260  005667  176536                          SBC     ANS1
        002264  173767  176532                          CMPF    ANS1,   AC3             ;CHECK ANSWERS AGAIN
        002270  170000                                  CFCC                            ;COPY FLOATING CONDITION CODES
        002272  001403                                  BEQ     END3                    ;BRANCH IF OK
        002274  174267  176522                          STF     AC2,    ANS1            ;SAVE FPU ANSWER
        002300  104000                                  HLT                             ;FPU AND FORTRAN DISAGREE

        002302  005067  176534                  END3:   CLR     FPS                     ;CLR FPU FPS BUFFER
        002306  104400                                  SCOPE
```

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                        ;*****************************************************************
                        ;TEST 4:        EXERCISE DIVD (DIVIDE DOUBLE PRECISION)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF
                        ;                       ROUNDING MODE
                        ;*****************************************************************

002310  012767  004600  176532          MOV     #004600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
002316  005067  176530                  CLR     $FEC            ;CLR FORTRAN FEC
002322  005067  176526                  CLR     $FPC            ;CLR FORTRAN FPC
002326  005067  176516                  CLR     FPS             ;CLR FPU FPS BUFFER
002332  005067  176506                  CLR     FEC             ;CLR FPU FEC BUFFER
002336  005067  176504                  CLR     FPC             ;CLR FPU FPC BUFFER
002342  004767  000036                  JSR     R0,     RANDOM  ;GET RANDOM INPUT DATA
002346  004467  003726                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
002352  006302                          SP.4A                   ;PUSH 4 WORDS ON STACK (LONUM
002354  006324                          SP.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
002356  0000006                         $DIVD                   ;ADDRESS OF FORTRAN DIVIDE
002360  006402                          $ENDP                   ;DETERMINE THE CONDITION CODES
002362  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

002364  016700  176460                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
002370  170127  040200                  LDFPS   #040200         ;SET FID AND FD
002374  172467  176402                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
002400  172567  176406                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
002404  172767  176422                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
002410  170127  004600                  LDFPS   #004600         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
002414  012767  002422  006560          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

002422  172600                  LAD:    LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
002424  174601                          DIVD    AC1,    AC2     ;DIVIDE AC1 INTO AC2
002426  005767  176416                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
002432  100412                          BMI     ERR4            ;BRANCH IF ERROR FLAG SET
002434  170267  176402                  STFPS   FPS             ;STORE FLOATING POINT STATUS
002440  026767  176376  176402          CMP     FPS,    $FPS    ;CHECK FPS
002446  001427                          BEQ     TST4            ;BRANCH IF OK
002450  174267  176346                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
002454  104001                          HLT     +1              ;FPS ERROR
002456  000454                          BR      END4            ;SKIP COMPARE

002460  170000                  ERR4:   CFCC                    ;WAIT FOR FPU TO FINISH
002462  026767  176354  176360          CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
002470  001402                          BEQ     .+6             ;BRANCH IF OK
002472  104377                          HLT     +377            ;FPS ERROR
002474  000445                          BR      END4            ;SKIP TO END

002476  026767  176342  176346          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
002504  001402                          BEQ     .+6             ;BRANCH IF OK
002506  104377                          HLT     +377            ;FEC IS WRONG
002510  000437                          BR      END4            ;SKIP TO END

002512  026767  176330  176334          CMP     FPC,$FPC        ;CHECK FLOATING PC
002520  001402                          BEQ     TST4            ;BRANCH IF OK
002522  104377                          HLT     +377            ;WRONG ADDRESS IN FPC
```

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002524  000431                               BR      END4             ;SKIP TO END

002526  032767  000002  176314  TST4:        BIT     #2,     $FPS     ;CHECK FOR OVERFLOW
002534  001025                               BNE     END4             ;BRANCH IF OVERFLOW
002536  173702                               CMPD    AC2,    AC3      ;COMPARE FPU ANSWER TO FORTRAN ANSWER
002540  170000                               CFCC                     ;COPY FLOATING CONDITION CODES
002542  001422                               BEQ     END4             ;ANSWERS CHECK
                                             ;COMPENSATE FOR FORTRAN INACCURACIES.
002544  174267  176252                       STD     AC2,    ANS1     ;SAVE FPU ANSWER
002550  162767  000001  176252               SUB     #1,     ANS1+6   ;DECREMENT FPU ANSWER
002556  005667  176244                       SBC     ANS1+4
002562  005667  176236                       SBC     ANS1+2
002566  005667  176230                       SBC     ANS1
002572  173767  176224                       CMPD    ANS1,   AC3      ;CHECK ANSWERS AGAIN
002576  170000                               CFCC                     ;COPY FLOATING CONDITION CODES
002600  001402                               BEQ     END4             ;BRANCH IF OK
002602  174267  176214                       STD     AC2,    ANS1     ;SAVE FPU ANSWER
002606  104000                               HLT                      ;FPU AND FORTRAN DISAGREE

002610  005067  176226          END4:        CLR     FPS              ;CLR FPU FPS BUFFER
002614  104400                               SCOPE

                                ;******************************************************************
                                ;TEST 5:        EXERCISE DIVF (DIVIDE FLOATING)
                                ;                          ALL INTEPUPTS ON
                                ;                          TRUNCATE MODE
                                ;******************************************************************

002616  012767  007440  176224               MOV     #007440,$FPS     ;SET IE BITS IN FORTRAN ANSWER
002624  005067  176222                       CLR     $FEC             ;CLR FORTRAN FEC
002630  005067  176220                       CLR     $FPC             ;CLR FORTRAN FPC
002634  005067  176202                       CLR     FPS              ;CLR FPU FPS BUFFER
002640  005067  176200                       CLR     FEC              ;CLR FPU FEC BUFFER
002644  005067  176176                       CLR     FPC              ;CLR FPU FPC BUFFER
002650  004767  004372                       JSR     PC,     RANDM2   ;GET RANDOM INPUT DATA
002654  004467  003420                       JSR     R4,     $POLSH   ;ENTER POLISH MODE
002660  006312                               $P.2A                    ;PUSH 2 WORDS ON STACK (LONUM)
002662  006334                               $P.2B                    ;PUSH 2 WORDS ON STACK (HINUM)
002664  000000G                              $DVR                     ;ADDRESS OF FORTRAN DIVIDE
002666  006402                               $TST                     ;DETERMINE THE CONDITION CODES
002670  006346                               $POP2X                   ;POP 2 WORDS AND EXIT POLISH MODE

002672  016700  176152                       MOV     $FPS,   R0       ;DISPLAY FLOATING POINT STATUS
002676  170127  040000                       LDFPS   #040000          ;SET FID
002702  172467  176074                       LDF     LONUM,  AC0      ;LOAD AC0 WITH A RANDOM NUMBER
002706  172567  176100                       LDF     HINUM,  AC1      ;LOAD AC1 WITH A RANDOM NUMBER
002712  172767  176114                       LDF     ANS2,   AC3      ;LOAD AC3 WITH THE SUM
002716  170127  007440                       LDFPS   #007440          ;TURN INTERUPTS ON
002722  012767  002730  006252               MOV     #.+6,   LAD      ;RESET LOOP ADDRESS

                                ;******************************************************************

002730  172600                               LDF     AC0,    AC2      ;LOAD AC0 INTO AC2
002732  174601                  RETS:        DIVF    AC1,    AC2      ;DIVIDE AC1 INTO AC2
002734  005767  176110                       TST     $FPS             ;CHECK FOR FORTRAN FPS ERROR FLAG
002740  100412                               BMI     ERRS             ;BRANCH IF ERROR FLAG SET
```

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                                        STFPS   FPS             ;STORE FLOATING POINT STATUS
                                        CMP     FPS,    $FPS    ;CHECK FPS
                                        BEQ     TST5            ;BRANCH IF OK
                                        STF     AC2,    ANS1    ;SAVE FPU ANSWER
                                        HLT+1                   ;FPS ERROR
                                        BR      END5            ;SKIP COMPARE

                                ERR5:   CFCC                    ;WAIT FOR FPU TO FINISH
                                        CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
                                        BEQ     .+6             ;BRANCH IF OK
                                        HLT+377                 ;FPS ERROR
                                        BR      END5            ;SKIP TO END

                                        CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
                                        BEQ     .+6             ;BRANCH IF OK
                                        HLT+277                 ;FEC IS WRONG
                                        BR      END5            ;SKIP TO END

                                        CMP     FPC,$FPC        ;CHECK FLOATING PC
                                        BEQ     TST5            ;BRANCH IF OK
                                        HLT+377                 ;WRONG ADDRESS IN FPC
                                        BR      END5            ;SKIP TO END

                                TST5:   CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
                                        CFCC                    ;COPY FLOATING CONDITION CODES
                                        BEQ     END5            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
                                        STF     AC2,    ANS1    ;SAVE FPU ANSWER
                                        ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
                                        ADC     ANS1
                                        CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
                                        CFCC                    ;COPY FLOATING CONDITION CODES
                                        BEQ     END5            ;BRANCH IF OK
                                        SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
                                        SBC     ANS1
                                        CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
                                        CFCC                    ;COPY FLOATING CONDITION CODES
                                        BEQ     END5            ;BRANCH IF OK
                                        STF     AC2,    ANS1    ;SAVE FPU ANSWER
                                        HLT                     ;FPU AND FORTRAN DISAGREE

                                END5:   CLR     FPS             ;CLR FPU FPS BUFFER
                                        SCOPE

                                ;*****************************************************************
                                ;TEST 6:        EXERCISE DIVD (DIVIDE DOUBLE PRECISION.
                                ;                       ALL INTERUPTS ON
                                ;                       TRUNCATE MODE
                                ;*****************************************************************

                                        MOV     #007640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
                                        CLR     $FEC            ;CLR FORTRAN FEC
                                        CLR     $FPC            ;CLR FORTRAN FPC
                                        CLR     FPS             ;CLR FPU FPS BUFFER
                                        CLR     FEC             ;CLR FPU FEC BUFFER
                                        CLR     FPC             ;CLR FPU FPC BUFFER
```

```
003160  004767  004220                  JSR     R0,     RANDM4  ;GET RANDOM INPUT DATA
003164  004467  003110                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
003170  006302                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
003172  006324                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
003174  000000G                         $DVD                    ;ADDRESS OF FORTRAN DIVIDE
003176  006402                          $TST                    ;DETERMINE THE CONDITION CODES
003200  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

003202  016700  175642                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
003206  170127  040200                  LDFPS   #040200         ;SET FID AND FD
003212  172467  175564                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
003216  172567  175570                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
003222  172767  175604                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
003226  170127  007640                  LDFPS   #007640         ;TURN INTERUPTS ON
003232  012767  003240  005742          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

003240  172600                  BEG6:   LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
003242  174601                          DIVD    AC1,    AC2     ;DIVIDE AC1 INTO AC2
003244  005767  175600                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
003250  100412                          BMI     ERR6            ;BRANCH IF ERROR FLAG SET
003252  170267  175564                  STFPS   FPS             ;STORE FLOATING POINT STATUS
003256  026767  175560  175564          CMP     FPS,    $FPS    ;CHECK FPS
003264  001427                          BEQ     TST6            ;BRANCH IF OK
003266  174267  175530                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003272  104001                          HLT+1                   ;FPS ERROR
003274  000465                          BR      END6            ;SKIP TO END

003276  170000                  ERR6:   CFCC                    ;WAIT FOR FPU TO FINISH
003300  026767  175536  175542          CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
003306  001402                          BEQ     .+6             ;BRANCH IF OK
003310  104377                          HLT+377                 ;FPS ERROR
003312  000456                          BR      END6            ;SKIP TO END

003314  026767  175524  175530          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
003322  001402                          BEQ     .+6             ;BRANCH IF OK
003324  104377                          HLT+377                 ;FEC IS WRONG
003326  000450                          BR      END6            ;SKIP TO END

003330  026767  175512  175516          CMP     FPC,$FPC        ;CHECK FLOATING PC
003336  001402                          BEQ     TST6            ;BRANCH IF OK
003340  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
003342  000442                          BR      END6            ;SKIP TO END

003344  173702                  TST6:   CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
003346  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003350  001437                          BEQ     END6            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
003352  174267  175444                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003356  062767  000001  175444          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
003364  005567  175436                  ADC     ANS1+4
003370  005567  175432                  ADC     ANS1+2
003374  005567  175426                  ADC     ANS1
003400  173767  175416                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003404  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
```

```
003406  001420                          BEQ     END6            ;BRANCH IF OK
003410  162767  000002  175412          SUB     #2      ANS1+6  ;DECREMENT FPU ANSWER
003416  005667  175404                  SBC     ANS1+4
003422  005667  175376                  SBC     ANS1+2
003426  005667  175370                  SBC     ANS1
003432  173767  175364                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003436  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003440  001403                          BEQ     END6            ;BRANCH IF OK
003442  174267  175354                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003446  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

003450  005067  175366          END6:   CLR     FPS             ;CLR FPU FPS BUFFER
003454  104400                          SCOPE
```

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;*****************************************************************
;TEST 7:        EXERCISE DIVF (DIVIDE FLOATING)
;               OVERFLOW AND UNDERFLOW INTERUPTS OFF.
;               TRUNCATE MODE
;*****************************************************************
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```
003456  012767  004440  175364          MOV     #004440,$FPS    ;SET IE BITS IN FORTRAN ANSWER
003464  005067  175362                  CLR     $FEC            ;CLR FORTRAN FEC
003470  005067  175360                  CLR     $FPC            ;CLR FORTRAN FPC
003474  005067  175342                  CLR     FPS             ;CLR FPU FPS BUFFER
003500  005067  175340                  CLR     FEC             ;CLR FPU FEC BUFFER
003504  005067  175336                  CLR     FPC             ;CLR FPU FPC BUFFER
003510  004767  003532                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
003514  004467  002560                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
003520  006312                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
003522  006334                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
003524  0000006                         $DVF                    ;ADDRESS OF FORTRAN DIVIDE
003526  006402                          $TST                    ;DETERMINE THE CONDITION CODES
003530  006346                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

003532  016700  175312                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
003536  170127  040000                  LDFPS   #040000         ;SET FID
003542  172467  175234                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
003546  172567  175240                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
003552  172767  175254                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
003556  170127  004440                  LDFPS   #004440         ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
003562  012767  003570  005412          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS
```

```
;*****************************************************************
003570  172600                          LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
003572  174601                  RET7:   DIVF    AC1,    AC2     ;DIVIDE AC1 INTO AC2
003574  005767  175250                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
003600  100412                          BMI     ERR7            ;BRANCH IF ERROR FLAG SET
003602  170267  175234                  STFPS   FPS             ;STORE FLOATING POINT STATUS
003606  026767  175230  175234          CMP     FPS,    $FPS    ;CHECK FPS
003614  001427                          BEQ     .+54            ;BRANCH IF OK
003616  174267  175200                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003622  104001                          HLT+1                   ;FPS ERROR
003624  000461                          BR      END7            ;SKIP COMPARE

003626  170000                  ERR7:   CFCC                    ;WAIT FOR FPU TO FINISH
```

```
003630  026767  175206  175212          CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
003636  001402                          BEQ     .+6             ;BRANCH IF OK
003640  104377                          HLT+377                 ;FPS ERROR
003642  000452                          BR      END7            ;SKIP TO END

003644  026767  175174  175200          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
003652  001402                          BEQ     .+6             ;BRANCH IF OK
003654  104377                          HLT+377                 ;FEC IS WRONG
003656  000444                          BR      END7            ;SKIP TO END

003660  026767  175162  175166          CMP     FPC,$FPC        ;CHECK FLOATING PC
003666  001402                          BEQ     .+6             ;BRANCH IF OK
003670  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
003672  000436                          BR      END7            ;SKIP TO END

003674  032767  000002  175146  TST7:   BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
003702  001032                          BNE     END7            ;BRANCH IF OVERFLOW
003704  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
003706  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003710  001427                          BEQ     END7            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
003712  174267  175104                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003716  062767  000001  175100          ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
003724  005567  175072                  ADC     ANS1
003730  173767  175066                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003734  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003736  001414                          BEQ     END7            ;BRANCH IF OK
003740  162767  000002  175056          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
003746  005667  175050                  SBC     ANS1
003752  173767  175044                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003756  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003760  001403                          BEQ     END7            ;BRANCH IF OK
003762  174267  175034                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003766  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

003770  005067  175046          END7:   CLR     FPS             ;CLR FPU FPS BUFFER
003774  104400                          SCOPE

                                ;*****************************************************************
                                ;TEST IC:       EXERCISE DIVD (DIVIDE DOUBLE PRECISION)
                                ;               OVERFLOW AND UNDERFLOW INTERUPTS OFF
                                ;               TRUNCATE MODE
                                ;*****************************************************************

003776  012767  004640  175044          MOV     #004640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
004004  005067  175042                  CLR     $FEC            ;CLR FORTRAN FEC
004010  005067  175040                  CLR     $FPC            ;CLR FORTRAN FPC
004014  005067  175022                  CLR     FPS             ;CLR FPU FPS BUFFER
004020  005067  175020                  CLR     FEC             ;CLR FPU FEC BUFFER
004024  005067  175016                  CLR     FPC             ;CLR FPU FPC BUFFER
004030  004767  003350                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
004034  004467  002240                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
004040  006302                          SP.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
004042  006324                          SP.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
004044  000000                          $DVD                    ;ADDRESS OF FORTRAN DIVIDE
004046  006402                          $TST                    ;DETERMINE THE CONDITION CODES
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004050  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

004052  016700  174772                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
004056  170127  040200                  LDFPS   #040200         ;SET FID AND FD
004062  172467  174714                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
004066  172567  174720                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
004072  172767  174734                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
004076  170127  004640                  LDFPS   #004640         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
004102  012767  004110  005072          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************************

004110  172600                  RE10:   LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
004112  174601                          DI.D    AC1,    AC2     ;DIVIDE AC1 INTO AC2
004114  005767  174730                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
004120  100412                          BMI     ERR10           ;BRANCH IF ERROR FLAG SET
004122  170267  174714                  STFPS   FPS             ;STORE FLOATING POINT STATUS
004126  026767  174710  174714          CMP     FPS,    $FPS    ;CHECK FPS
004134  001427                          BEQ     TST10           ;BRANCH IF OK
004136  174267  174660                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004142  104001                          HLT+1                   ;FPS ERROR
004144  000471                          BR      END10           ;SKIP COMPARE

004146  170000                  ERR10:  CFCC                    ;WAIT FOR FPU TO FINISH
004150  026767  174666  174672          CMP     FPS,$FPS        ;CHECK THE FLOATING POINT STATUS
004156  001402                          BEQ     .+6             ;BRANCH IF OK
004160  104377                          HLT+377                 ;FPS ERROR
004162  000462                          BR      END10           ;SKIP TO END

004164  026767  174654  174660          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
004172  001402                          BEQ     .+6             ;BRANCH IF OK
004174  104377                          HLT+377                 ;FEC IS WRONG
004176  000454                          BR      END10           ;SKIP TO END

004200  026767  174642  174646          CMP     FPC,$FPC        ;CHECK FLOATING PC
004206  001450                          BEQ     END10           ;BRANCH IF OK
004210  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
004212  000446                          BR      END10           ;SKIP TO END

004214  032767  000002  174626  TST10:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
004222  001042                          BNE     END10           ;BRANCH IF OVERFLOW
004224  173702                          CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
004226  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004230  001437                          BEQ     END10           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
004232  174267  174564                  STD     AC2,    ANS     ;SAVE FPU ANSWER
004236  062767  000001  174564          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
004244  005567  174556                  ADC     ANS1+4
004250  005567  174550                  ADC     ANS1+2
004254  005567  174542                  ADC     ANS1
004260  173767  174536                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004264  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004266  001420                          BEQ     END10           ;BRANCH IF OK
004270  162767  000002  174532          SUB     #2,     ANS1+6  ;DECREMENT FPU ANSWER
004276  005667  174524                  SBC     ANS1+4
004302  005667  174516                  SBC     ANS1+2
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004306  005667  174510                  SBC     ANS1
004312  173767  174504                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004316  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004320  001403                          BEQ     END10           ;BRANCH IF OK
004322  174267  174474                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004326  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

004330  005067  174506          END10:  CLR     FPS             ;CLR FPU FPS BUFFER
004334  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 11:       EXERCISE DIVF (DIVIDE FLOATING,
                        ;                       INTERUPT DISABLE SET
                        ;                       ROUNDING MODE
                        ;*****************************************************************

004336  012767  047400  174504            MOV     #047400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
004344  005067  174502                    CLR     $FEC            ;CLR FORTRAN FEC
004350  005067  174500                    CLR     $FPC            ;CLR FORTRAN FPC
004354  005067  174462                    CLR     FPS             ;CLR FPU FPS BUFFER
004360  005067  174460                    CLR     FEC             ;CLR FPU FEC BUFFER
004364  005067  174456                    CLR     FPC             ;CLR FPU FPC BUFFER
004370  004767  002652                    JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
004374  004467  001700                    JSR     R4,     $POLSH  ;ENTER POLISH MODE
004400  006312                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
004402  006334                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
004404  000000G                         $DVR                    ;ADDRESS OF FORTRAN DIVIDE
004406  006402                          $TST                    ;DETERMINE THE CONDITION CODES
004410  006346                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

004412  016700  174432                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
004416  170127  040000                  LDFPS   #040000         ;SET FID
004422  172467  174354                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
004426  172567  174360                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
004432  172767  174374                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
004436  170127  047400                  LDFPS   #047400         ;SET INTERUPT DISABLE AND INTERUPT BITS
004442  012767  004450  004532          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

004450  172600                  RET11:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
004452  174601                          DIVF    AC1,    AC2     ;DIVIDE AC1 INTO AC2
004454  170267  174362                  STFPS   FPS             ;STORE FLOATING POINT STATUS
004460  005767  174364                  TST     $FPS            ;CHECK FOR ERROR FLAG
004464  100410                          BMI     ERR11           ;BRANCH IF ERROR FLAG SET
004466  026767  174350  174354          CMP     FPS,    $FPS    ;CHECK FPS
004474  001430                          BEQ     TST11           ;BRANCH IF OK
004476  174267  174320                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004502  104001                          HLT+1                   ;FPS ERROR
004504  000451                          BR      END11           ;SKIP COMPARE

004506  170367  174332          ERR11:  STST    FEC             ;STORE FEC AND FPC
004512  026767  174324  174330          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
004520  001402                          BEQ     .+6             ;BRANCH IF OK
004522  104377                          HLT+377                 ;FPS ERROR
004524  000741                          BR      END11           ;SKIP TO END
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004526  026767  174312  174316          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
004534  001402                          BEQ     .+6             ;BRANCH IF OK
004536  104377                          HLT+377                 ;FEC IS WRONG
004540  000433                          BR      END11           ;SKIP TO END

004542  026767  174300  174304          CMP     FPC,$FPC        ;CHECK FLOATING PC
004550  001402                          BEQ     TST11           ;BRANCH IF OK
004552  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
004554  000425                          BR      END11           ;SKIP TO END

004556  032767  000002  174264  TST11:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
004564  001021                          BNE     END11           ;BRANCH IF OVERFLOW
004566  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
004570  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004572  001416                          BEQ     END11           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
004574  174267  174222                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004600  162767  000001  174216          SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
004606  005667  174210                  SBC     ANS1
004612  173767  174204                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004616  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004620  001403                          BEQ     END11           ;BRANCH IF OK
004622  174267  174174                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004626  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

004630  005067  174206          END11:  CLR     FPS             ;CLR FPU FPS BUFFER
004634  104400                          SCOPE
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                        ;*****************************************************************
                        ;TEST 12:       EXERCISE DIVD (DIVIDE DOUBLE PRECISION)
                        ;                       INTERUPT DISABLE SET
                        ;                       ROUNDING MODE
                        ;*****************************************************************

004636  012767  047600  174204          MOV     #047600,$FPS    ;SET FID AND IE BITS IN FORTRAN ANSWER
004644  005067  174202                  CLR     $FEC            ;CLR FORTRAN FEC
004650  005067  174200                  CLR     $FPC            ;CLR FORTRAN FPC
004654  005067  174162                  CLR     FPS             ;CLR FPU FPS BUFFER
004660  005067  174160                  CLR     FEC             ;CLR FPU FEC BUFFER
004664  005067  174156                  CLR     FPC             ;CLR FPU FPC BUFFER
004670  004767  002510                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
004674  004467  001400                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
004700  006302                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
004702  006324                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
004704  000000G                         $DVD                    ;ADDRESS OF FORTRAN DIVIDE
004706  006402                          $TST                    ;DETERMINE THE CONDITION CODES
004710  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

004712  016700  174132                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
004716  170127  040200                  LDFPS   #040200         ;SET FID AND FD
004722  172467  174054                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
004726  172567  174060                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
004732  172767  174074                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
004736  170127  047600                  LDFPS   #047600         ;SET INTERUPT DISABLE AND INTERUPT BITS
004742  012767  004750  004232          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                        ;*****************************************************************

004750  172600                  RET12:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
004752  174601                          DIVD    AC1,    AC2     ;DIVIDE AC1 INTO AC2
004754  170267  174062                  STFPS   FPS             ;STORE FLOATING POINT STATUS
004760  005767  174064                  TST     $FPS            ;CHECK FOR ERROR FLAG
004764  100410                          BMI     ERR12           ;BRANCH IF ERROR FLAG SET
004766  026767  174050  174054          CMP     FPS,    $FPS    ;CHECK FPS
004774  001430                          BEQ     TST12           ;BRANCH IF OK
004776  174267  174020                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005002  104001                          HLT+1                   ;FPS ERROR
005004  000455                          BR      END12           ;SKIP COMPARE

005006  170367  174032          ERR12:  STST    FEC             ;STORE FEC AND FPC
005012  026767  174024  174030          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
005020  001402                          BEQ     .+6             ;BRANCH IF OK
005022  104377                          HLT+377                 ;FPS ERROR
005024  000445                          BR      END12           ;SKIP TO END

005026  026767  174012  174016          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
005034  001402                          BEQ     .+6             ;BRANCH IF OK
005036  104377                          HLT+377                 ;FEC IS WRONG
005040  000437                          BR      END12           ;SKIP TO END

005042  026767  174000  174004          CMP     FPC,$FPC        ;CHECK FLOATING PC
005050  001402                          BEQ     TST12           ;BRANCH IF OK
005052  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
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005054  000431                                  BR      END12           ;SKIP TO END

005056  032767  000002  173764  TST12:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
005064  001025                          BNE     END12           ;BRANCH IF OVERFLOW
005066  173702                          CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
005070  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005072  001422                          BEQ     END12           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
005074  174267  173722                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005100  162767  000001  173722          SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
005106  005667  173714                  SBC     ANS1+4
005112  005667  173706                  SBC     ANS1+2
005116  005667  173700                  SBC     ANS1
005122  173767  173674                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005126  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005130  001403                          BEQ     END12           ;BRANCH IF OK
005132  174267  173664                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005136  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

005140  005067  173676          END12:  CLR     FPS             ;CLR FPU FPS BUFFER
005144  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 13:       EXERCISE DIVF (DIVIDE FLOATING)
                        ;               INTERUPT DISABLE SET
                        ;               TRUNCATE MODE
                        ;*****************************************************************

005146  012767  047440  173674          MOV     #047440,$FPS    ;SET FID AND IE BITS IN FORTRAN ANSWER
005154  005067  173672                  CLR     $FEC            ;CLR FORTRAN FEC
005160  005067  173670                  CLR     $FPC            ;CLR FORTRAN FPC
005164  005067  173652                  CLR     FPS             ;CLR FPU FPS BUFFER
005170  005067  173650                  CLR     FEC             ;CLR FPU FEC BUFFER
005174  005067  173646                  CLR     FPC             ;CLR FPU FPC BUFFER
005200  004767  002042                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
005204  004467  001070                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
005210  006312                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
005212  006334                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
005214  000000G                         $DVR                    ;ADDRESS OF FORTRAN DIVIDE
005216  006402                          $TST                    ;DETERMINE THE CONDITION CODES
005220  006346                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

005222  016700  173622                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
005226  170127  040000                  LDFPS   #040000         ;SET FID
005232  172467  173544                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
005236  172567  173550                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
005242  172767  173564                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
005246  170127  047440                  LDFPS   #047440         ;SET INTERUPT DISABLE AND INTERUPT BITS
005252  012767  005260  003722          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS
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                                        ;*****************************************************************************

005260  172620                  RET13:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
005262  172621                          DIVF    AC1,    AC2     ;DIVIDE AC1 INTO AC2
005264  170267  173552                  STFPS   FPS             ;STORE FLOATING POINT STATUS
005270  005767  173554                  TST     $FPS            ;CHECK FOR ERROR FLAG
005274  100416                          BMI     ERR13           ;BRANCH IF ERROR FLAG SET
005276  026767  173540  173544          CMP     FPS,    $FPS    ;CHECK FPS
005304  001430                          BEQ     TST13           ;BRANCH IF OK
005306  174267  173510                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005312  104001                          HLT+1                   ;FPS ERROR
005314  000462                          BR      END13           ;SKIP COMPARE

005316  170367  173522          ERR13:  STST    FEC             ;STORE FEC AND FPC
005322  026767  173514  173520          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
005330  001402                          BEQ     .+6             ;BRANCH IF OK
005332  104377                          HLT+377                 ;FPS ERROR
005334  000452                          BR      END13           ;SKIP TO END

005336  026767  173502  173506          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
005344  001402                          BEQ     .+6             ;BRANCH IF OK
005346  104377                          HLT+377                 ;FEC IS WRONG
005350  000444                          BR      END13           ;SKIP TO END

005352  026767  173470  173474          CMP     FPC,$FPC        ;CHECK FLOATING PC
005360  001402                          BEQ     TST13           ;BRANCH IF OK
005362  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
005364  000436                          BR      END13           ;SKIP TO END

005366  032767  000002  173454  TST13:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
005374  001032                          BNE     END13           ;BRANCH IF OVERFLOW
005376  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
005400  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005402  001427                          BEQ     END13           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
005404  174267  173412                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005410  062767  000001  173406          ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
005416  005567  173400                  ADC     ANS1
005422  173767  173374                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005426  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005430  001414                          BEQ     END13           ;BRANCH IF OK
005432  162767  000002  173364          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
005440  005667  173356                  SBC     ANS1
005444  173767  173352                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005450  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005452  001403                          BEQ     END13           ;BRANCH IF OK
005454  174267  173342                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005460  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

005462  005067  173334          END13:  CLR     FPS             ;CLR FPU FPS BUFFER
005466  104401                          SCOPE
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                                ;*****************************************************************
                                ;TEST 14:       EXERCISE DIVD (DIVIDE DOUBLE PRECISION)
                                ;               INTERUPT DISABLE SET
                                ;               TRUNCATE MODE
                                ;*****************************************************************

005506  012767  047640  173352          MOV     #047640,$FPS    ;SET FID AND IE BITS IN FORTRAN ANSWER
005514  005067  173350                  CLR     $FEC            ;CLR FORTRAN FEC
005520  005067  173346                  CLR     $FPC            ;CLR FORTRAN FPC
005524  005067  173340                  CLR     FPS             ;CLR FPU FPS BUFFER
005530  005067  173336                  CLR     FEC             ;CLR FPU FEC BUFFER
005534  005067  173334                  CLR     FPC             ;CLR FPU FPC BUFFER
005540  004767  001656                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
005544  004467  000546                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
005550  006302                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM
005552  006324                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM
005554  000000G                         $DVD                    ;ADDRESS OF FORTRAN DIVIDE
005556  006402                          $[illegible]            ;DETERMINE THE CONDITION CODES
005560  006350                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

005562  016700  173300                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
005566  170127  040200                  LDFPS   #040200         ;SET FID AND FD
005572  172467  173322                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
005576  172567  173226                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
005602  172767  173242                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
005606  170127  047640                  LDFPS   #047640         ;SET INTERUPT DISABLE AND INTERUPT BITS
005612  012767  005622  003400          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

                                ;*****************************************************************

005620  172600                  LAD:    LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
005622  174601                  TEST14: DIVD    AC1,    AC2     ;DIVIDE AC1 INTO AC2
005624  170267  173230                  STFPS   FPS             ;STORE FLOATING POINT STATUS
005630  005767  173224                  TST     $FPS            ;CHECK FOR ERROR FLAG
005634  100410                          BMI     ERR14           ;BRANCH IF ERROR FLAG SET
005636  026767  173216  173222          CMP     FPS,    $FPS    ;CHECK FPS
005644  001430                          BEQ     TS14            ;BRANCH IF OK
005646  174267  173160                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005652  104001                          HLT+1                   ;FPS ERROR
005654  000472                          BR      END14           ;SKIP COMPARE

005656  170367  173200          ERR14:  STST    FEC             ;STORE FEC AND FPC
005662  026767  173172  173176          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
005670  001402                          BEQ     .+6             ;BRANCH IF OK
005672  104377                          HLT+377                 ;FPS ERROR
005674  000462                          BR      END14           ;SKIP TO END

005676  026767  173160  173164          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
005704  001402                          BEQ     .+6             ;BRANCH IF OK
005706  104377                          HLT+377                 ;FEC IS WRONG
005710  000454                          BR      END14           ;SKIP TO END

005712  026767  173146  173152          CMP     FPC,$FPC        ;CHECK FLOATING PC
005720  001402                          BEQ     TS14            ;BRANCH IF OK
005722  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
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        005706  000446                                  BR      END14                   ;SKIP TO END

        005710  032767  000002  173132  TST14:          BIT     #2,     $FPS            ;CHECK FOR OVERFLOW
        005716  001042                                  BNE     END14                   ;BRANCH IF OVERFLOW
        005720  173732                                  CMPD    AC2,    AC3             ;COMPARE FPU ANSWER TO FORTRAN ANSWER
        005722  170000                                  CFCC                            ;COPY FLOATING CONDITION CODES
        005724  001437                                  BEQ     END14                   ;ANSWERS CHECK
                                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
        005726  174267  173070                          STD     AC2,    ANS1            ;SAVE FPU ANSWER
        005732  062767  000001  173070                  ADD     #1,     ANS1+6          ;INCREMENT FPU ANSWER
        005740  005567  173062                          ADC     ANS1+4
        005744  005567  173054                          ADC     ANS1+2
        005750  005567  173046                          ADC     ANS1
        005754  173767  173042                          CMPD    ANS1,   AC3             ;CHECK ANSWERS AGAIN
        005760  170000                                  CFCC                            ;COPY FLOATING CONDITION CODES
        005762  001420                                  BEQ     END14                   ;BRANCH IF OK
        005764  162767  000002  173036                  SUB     #2,     ANS1+6          ;DECREMENT FPU ANSWER
        005772  005667  173030                          SBC     ANS1+4
        005776  005667  173022                          SBC     ANS1+2
        006002  005667  173014                          SBC     ANS1
        006006  173767  173010                          CMPD    ANS1,   AC3             ;CHECK ANSWERS AGAIN
        006012  170000                                  CFCC                            ;COPY FLOATING CONDITION CODES
        006014  001403                                  BEQ     END14                   ;BRANCH IF OK
        006016  174267  173000                          STD     AC2,    ANS1            ;SAVE FPU ANSWER
        006022  104000                                  HLT                             ;FPU AND FORTRAN DISAGREE

        006024  005067  173012          END14:          CLR     FPS                     ;CLR FPU FPS BUFFER
        006030  104400                                  SCOPE
```

```
006032  032737  002000  177570  DONE:   BIT     #SW10,@#SWR     ;RING THE BELL?
006040  001005                          BNE     1$              ;NO!
006042  012767  000207  003126          MOV     #BELL,.TYPE     ;TYPE A BELL
006050  000004  011176                  TYPE,   .TYPE
006054  005046                  1$:     CLR     -(6)            ;CLEAR TRACE TRAP
006056  032737  010000  177570          BIT     #SW12,@#SWR     ;RUN WITH TRT?
006064  001010                          BNE     2$
006066  005167  003106                  COM     TRPB
006072  100005                          BPL     2$
006074  052716  000020                  BIS     #20,(6)         ;SET TRACE TRAP
006100  012746  006132                  MOV     #3$,    - 6.    ;JUMP TO START OF TEST
006104  000002                          RTI
006106  012746  006114          2$:     MOV     #4$,    - 6     ;JUMP TO START OF TEST
006112  000002                          RTI
006114  013700  000042          4$:     MOV     @#42,R0         ;GET MONITOR ADDRESS
006120  001404                          BEQ     3$              ;IF NONE
006122  004710                          JSR     7,(0)           ;GO TO MONITOR
006124  000240                          NOP
006126  000240                          NOP
006130  000240                          NOP
006132  000137  000200          3$:     JMP     @#200           ;JUMP TO START OF TEST
006136  000002          YESRT:  RTI                             ;RETURN TO PROGRAM FROM TRAP

006140  032737  000400  177570  .EMT:   BIT     #SW08,@#SWR     ;KILL LOOP OR LOOP ON SPEC. TEST
006146  001404                          BEQ     1$
006150  123767  177570  172622          CMPB    @#SWR,ICNT      ;ON RIGHT TEST?  #SW7-0#
006156  001437                          BEQ     OVER
006160  113703  177570          1$:     MOVB    @#SWR,R3        ;GET US BITS
006164  170003                          LDUB
006166  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST
006174  001026                          BNE     KIT
006176  032737  004000  177570          BIT     #SW11,@#SWR     ;KILL ITERATIONS
006204  001012                          BNE     SAVLAD
006206  105767  172567                  TSTB    ICNT+1
006212  001404                          BEQ     2$              ;BRANCH IF FIRST
006214  126767  002770  172557          CMPB    TIMES,ICNT+1    ;DONE?
006222  001013                          BNE     KIT             ;BRANCH IF NOT
006224  112767  000001  172547  2$:     MOVB    #1,ICNT+1       ;FIRST ITERATION
006232  105267  172542          SAVLAD: INCB    ICNT            ;COUNT TEST NUMBERS
006236  011667  002740                  MOV     (6),LAD         ;SAVE LOOP ADDRESS
006242  016737  172532  177570          MOV     ICNT,@#DISPLAY  ;DISPLAY TEST NO. AND ITERATION COUNT
006250  000002                          RTI                     ;RETURN

006252  105267  172523          KIT:    INCB    ICNT+1
006256  016737  172516  177570  OVER:   MOV     ICNT,@#DISPLAY  ;SET UP DISPLAY
006264  005767  002712                  TST     LAD             ;FIRST ONE?
006270  001402                          BEQ     SAVLAD
006272  016676  002704                  MOV     LAD,-6          ;FUDGE RETURN ADDRESS
006276  000002                          RTI                     ;TYPES BS
```

```
006300  000134                          $POLSH: JMP     @(R4)+

006302  016746  172502                  $P.4A:  MOV     LONUM+6,-(SP)
006306  016746  172474                          MOV     LONUM+4,-(SP)
006312  016746  172466                  $P.2A:  MOV     LONUM+2,-(SP)
006316  016746  172460                          MOV     LONUM,  -(SP)
006322  000134                                  JMP     @(R4)+

006324  016746  172470                  $P.4B:  MOV     HINUM+6,-(SP)
006330  016746  172462                          MOV     HINUM+4,-(SP)
006334  016746  172454                  $P.2B:  MOV     HINUM+2,-(SP)
006340  016746  172446                          MOV     HINUM,  -(SP)
006344  000134                                  JMP     @(R4)+

006346  012667  172460                  $POP2Y: MOV     (SP)+,  ANS2
006352  012667  172456                          MOV     (SP)+,  ANS2+2
006356  000204                                  RTS     R4                      ;EXIT POLISH MODE

006360  012667  172446                  $POP4X: MOV     (SP)+,  ANS2
006364  012667  172444                          MOV     (SP)+,  ANS2+2
006370  012667  172442                          MOV     (SP)+,  ANS2+4
006374  012667  172440                          MOV     (SP)+,  ANS2+6
006400  000204                                  RTS     R4                      ;EXIT POLISH MODE

006402  032767  100002  172440          $TST:   BIT     #100002,$FPS            ;CHECK FOR ERROR FLAG AND OVERFLOW
006410  100453                                  BMI     $TER                    ;BRANCH IF FLAG SET
006412  001061                                  BNE     $TOV                    ;BRANCH IF OVERFLOW
006414  032716  077600                          BIT     #077600,(6)             ;TEST THE EXPONENT
006420  001041                                  BNE     $TST1                   ;BRANCH IF NOT ZERO
006422  052767  000004  172420                  BIS     #04,    $FPS            ;SET Z BIT
006430  032767  077600  172354                  BIT     #077600,HINUM           ;CHECK DIVISOR FOR ZERO
006436  001032                                  BNE     $TST1                   ;BRANCH IF NON-ZERO
006440  052767  100000  172402                  BIS     #100000,$FPS            ;SET THE ERROR FLAG
006446  012767  000004  172376                  MOV     #04,    $FEC            ;DIVIDE BY ZERO EXCEPTION CODE
006454  116701  172320                          MOVB    ICNT,   R1              ;GET THE TEST NUMBER
006460  006301                                  ASL     R1                      ;*2
006462  016167  006572  172364                  MOV     RETAD-2(R1),$FPC        ;GET EXPECTED PC
006470  016716  172306                          MOV     LONUM,  (SP)            ;RESTORE DIVIDEND
006474  016766  172304  000002                  MOV     LONUM+2,2(SP)           ;
006502  105767  172342                          TSTB    $FPS                    ;CHECK FOR DOUBLE PRECISION
006506  100006                                  BPL     $TST1                   ;BRANCH IF NOT
006510  016766  172272  000004                  MOV     LONUM+4,4(SP)           ;
006516  016766  172266  000006                  MOV     LONUM+6,6(SP)           ;
006524  005716                          $TST1:  TST     (SP)                    ;FIND THE SIGN
006526  100003                                  BPL     $TST2                   ;BRANCH IF PLUS
006530  052767  000010  172312                  BIS     #10,    $FPS            ;SET N BIT
006536  000134                          $TST2:  JMP     @(R4)+

006540  116701  172234                  $TER:   MOVB    ICNT,   R1              ;GET TEST NUMBER
006544  005301                                  DEC     R1                      ;SET POINTER
006546  006301                                  ASL     R1                      ;TEST # * 2
006550  016167  006574  172276                  MOV     RETAD(R1),$FPC          ;STORE FORTRAN FPC
006556  022626                          $TOV:   CMP     (SP)+,  (SP)+           ;"POP" 2 WORDS
006560  105767  172264                          TSTB    $FPS                    ;CHECK FD BIT
006564  [illegible]                             BPL     $TOV1                   ;BRANCH IF FLOATING MODE
```

```
006566  032626                          CMP     (SP)+,  SP)+    :"POP" 2 MORE WORDS
006570  001004                  $TOV1:  TST     (R4)+           :SKIP "POPX" ROUTINE
006572  000204                          RTS     R4              :EXIT POLISH MODE

006574  001342                  RETAD:  RET1
006576  001630                          RET2
006600  002126                          RET3
006602  002424                          RET4
006604  002732                          RET5
006606  003240                          RET6
006610  003570                          RET7
006612  004110                          RET8
006614  004460                          RET9
006616  004750                          RET10
006620  005262                          RET11
006622  005604                          RET12

006624  020027  002405          $ERRA:  CMP     R0,     #2405   :CHECK FOR UNDERFLOW, FD=0
006630  001420                          BEQ     $UNDR0          :BRANCH IF UNDERFLOW
006632  020027  004005                  CMP     R0,     #4005   :CHECK FOR UNDERFLOW, FD=1
006636  001433                          BEQ     $UNDR1          :BRANCH IF UNDERFLOW
006640  020027  003003                  CMP     R0,     #3003   :CHECK FOR OVERFLOW, FD=0
006644  001454                          BEQ     $OVER0          :BRANCH IF OVERFLOW
006646  020027  002003                  CMP     R0,     #2003   :CHECK FOR OVERFLOW, FD=1
006652  001463                          BEQ     $OVER1          :BRANCH IF OVERFLOW
006654  020027  004003                  CMP     R0,     #4003   :CHECK FOR DIVIDE BY ZERO, FD=0
006660  001531                          BEQ     $DVBZ0          :BRANCH IF DIVIDE BY ZERO
006662  020027  001403                  CMP     R0,     #1403   :CHECK FOR DIVIDE BY ZERO, FD=1
006666  001534                          BEQ     $DVBZ1          :BRANCH IF DIVIDE BY ZERO
006670  000000                  $UNKER: HALT                    :UNKNOWN ERROR!

006672  032767  003000  172150  $UNDR0: BIT     #003000,$FPS    :CHECK FOR INTERUPTS ON OR OFF
006700  001476                          BEQ     $ERTS           :BRANCH IF OFF
006702  004467  177372                  JSR     R4,     $POLSH  :ENTER POLISH MODE
006706  006312                          $P.2A                   :PUSH 2 WORDS ON STACK (LONUM)
006710  006334                          $P.2B                   :PUSH 2 WORDS ON STACK (HINUM)
006712  007100                          $SB200                  :SUBTRACT 200 FROM THE EXPONENT OF THE DIVISOR
006714  0000006                         $DVR                    :ADDRESS OF FORTRAN DIVIDE
006716  007122                          $200SB                  :SUBTRACT 200 FROM THE EXPONENT OF ANS
006720  006402                          $TST                    :DETERMINE CONDITION CODES
006722  006346                          $POP2X                  :POP 2 WORDS AND EXIT POLISH MODE
006724  000415                          BR      $UNDRA

006726  032767  003000  172114  $UNDR1: BIT     #003000,$FPS    :CHECK FOR INTERUPTS ON OR OFF
006734  001460                          BEQ     $ERTS           :BRANCH IF OFF
006736  004467  177336                  JSR     R4,     $POLSH  :ENTER POLISH MODE
006742  006302                          $P.4A                   :PUSH 2 WORDS ON STACK (LONUM)
006744  006324                          $P.4B                   :PUSH 2 WORDS ON STACK (HINUM)
006746  007100                          $SB200                  :SUBTRACT 200 FROM THE EXPONENT OF THE DIVISOR
006750  0000006                         $DVD                    :ADDRESS OF FORTRAN DIVIDE
006752  007122                          $200SB                  :SUBTRACT 200 FROM THE EXPONENT OF ANS
006754  006402                          $TST                    :DETERMINE CONDITION CODES
006756  006360                          $POP4X                  :POP 4 WORDS AND EXIT POLISH MODE
006760  052767  100000  172062  $UNDRA: BIS     #100000,$FPS    :SET FPS ERROR FLAG
006766  012767  000012  172056          MOV     #12.    $FEC    :SET UNDERFLOW EXCEPTION CODE
006774  000205                          RTS     R5              :RETURN TO FORTRAN ROUTINE
```

```
006776  004467  177276          $OVER0: JSR     R4,     $POLSH  ;ENTER POLISH MODE
007002  006312                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
007004  006324                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
007006  007114                          $AD200                  ;ADD 200 TO THE EXPONENT OF THE DEVISOR
007010  0000000                         $DVR                    ;ADDRESS OF FORTRAN DIVIDE
007012  007106                          $200AD                  ;ADD 200 TO THE EXPONENT OF ANS
007014  006402                          $TST                    ;DETERMINE CONDITION CODES
007016  006346                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE
007020  000411                          BR      $OVER4

007022  004467  177252          $OVER1: JSR     R4,     $POLSH  ;ENTER POLISH MODE
007026  006302                          $P.4A                   ;PUSH 2 WORDS ON STACK (LONUM)
007030  006324                          $P.4B                   ;PUSH 2 WORDS ON STACK (HINUM)
007032  007114                          $AD200                  ;ADD 200 TO THE EXPONENT OF THE DEVISOR
007034  0000000                         $DVD                    ;ADDRESS OF FORTRAN DIVIDE
007036  007106                          $200AD                  ;ADD 200 TO THE EXPONENT OF ANS
007040  006402                          $TST                    ;DETERMINE CONDITION CODES
007042  006360                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE
007044  032767  003000  171776  $OVER4: BIT     #003000,$FPS    ;CHECK FOR INTERUPTS ON OR OFF
007052  001406                          BEQ     $OVR1           ;BRANCH IF OFF
007054  052767  100000  171766          BIS     #100000,$FPS    ;SET FPS ERROR FLAG
007062  012767  000010  171762          MOV     #10.,   $FEC    ;SET OVERFLOW EXCEPTION CODE
007070  052767  000002  171752  $OVR1:  BIS     #02.,   $FPS    ;SET OVERFLOW BIT IN FPS
007076  000205          $ERTS:  RTS     %5

007100  162716  040000          $SB200: SUB     #040000, SP
007104  000134                          JMP     @(R4)+

007106  062716  140000          $200AD: ADD     #140000,(SP)
007112  000134                          JMP     @(R4)+

007114  062716  040000          $AD200: ADD     #040000,(SP)
007120  000134                          JMP     @(R4)+

007122  162716  040000          $200SB: SUB     #040000,(SP)
007126  032767  000003  170642          BIT     #3,     PS      ;TEST FOR 0 OR 4 BITS
007134  001402                          BEQ     $201SB
007136  062716  100000                  ADD     #100000,(SP)
007142  000134          $201SB: JMP     @(R4)+

007144  004467  177130          $DVBZ0: JSR     R4,     $POLSH  ;ENTER POLISH MODE
007150  006312                          $P.2A                   ;PUSH DIVIDEND
007152  006402                          $TST                    ;CALCULATE CONDITION CODES
007154  006346                          $POP2X                  ;POP DIVIDEND INTO ANSWER
007156  000405                          BR      $DVBZA

007160  004467  177114          $DVBZ1: JSR     R4,     $POLSH  ;ENTER POLISH MODE
007164  006302                          $P.4A                   ;PUSH DIVIDEND
007166  006402                          $TST                    ;CALCULATE CONDITION CODES
007170  006360                          $POP4X                  ;POP DIVIDEND INTO ANSWER
007172  052767  100000  171650  $DVBZA: BIS     #100000,$FPS    ;SET FPS ERROR FLAG
007200  012767  000004  171644          MOV     #04.,   $FEC    ;DIVIDE BY ZERO EXCEPTION CODE
007206  000205                          RTS     %5              ;RETURN TO FORTRAN

                        ;*****************************************************************
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                                ;FPP INTERUPT SERVICE ROUTINE
                                ;*************************************************************************

007210  170267  171626        FLTERR: STFPS   FPS              ;STORE FLOATING POINT STATUS
007214  170367  171624                STST    FEC              ;STORE FLOATING EXCEPTION CODES
007220  032767  040000  171622        BIT     #40000, $FPS     ;CHECK INTERUPT DISABLE
007226  001402                        BEQ     .+6              ;BRANCH IF OFF
007230  104377                        HLT+377                  ;INTERUPT NOT SUPPOSED TO BE ENABLED
007232  000404                        BR      ERRTI

007234  005767  171610                TST     $FPS             ;CHECK FORTRAN FPS FOR ERROR FLAG
007240  100401                        BMI     ERRTI            ;BRANCH IF FLAG SET
007242  104377                        HLT+377                  ;FLOATING POINT STATUS ERROR

007244  000002                ERRTI:  RTI
```

```
007246  010046          RANDM2: MOV     %0,-(6)         ;SAVE R0
007250  010146                  MOV     %1,-(6)         ;SAVE R1
007252  010246                  MOV     %2,-(6)         ;SAVE R2
007254  010346                  MOV     %3,-(6)         ;SAVE R3
007256  010446                  MOV     %4,-(6)         ;SAVE R4
007260  010546                  MOV     %5,-(6)         ;SAVE R5
007262  012704  001002          MOV     #LONUM,%4       ;SET UP LONUM POINTER
007266  012705  001012          MOV     #HINUM,%5       ;SET UP HINUM POINTER
007272  011400                  MOV     (4),%0          ;SET R0 WITH LOW
007274  011501                  MOV     (5),%1          ;SET R1 WITH HIGH
007276  012703  177771  REPET2: MOV     #-7,%3          ;SET SHIFT COUNT
007302  005002                  CLR     %2
007304  006300          SHIFT2: ASL     %0              ;SHIFT R0 LEFT AND
007306  006101                  ROL     %1              ;ROTATE CARRY INTO R1 AND
007310  006102                  ROL     %2              ;ROTATE CARRY INTO R2
007312  005203                  INC     %3              ;CHECK FOR DONE
007314  001373                  BNE     SHIFT2          ;CONTINUE SHIFT LOOP
007316  061402                  ADD     (4),%2          ;ADD NUMBER TO MAKE X 129
007320  005501                  ADC     %1              ;PROPOGATE CARRY
007322  061501                  ADD     (5),%1          ;ADD NUMBER TO MAKE X 129
007324  005502                  ADC     %2              ;PROPOGATE CARRY
007326  062700  001057          ADD     #1057,%0        ;ADD LOW CONSTANT
007332  005501                  ADC     %1              ;PROPOGATE CARRY
007334  005502                  ADC     %2              ;PROPOGATE CARRY
007336  062701  047401          ADD     #47401,%1       ;ADD HIGH CONSTANT
007342  005502                  ADC     %2              ;PROPOGATE CARRY
007344  062702  000006          ADD     #6,%2           ;ADD HIGHEST CONSTART
007350  060200                  ADD     %2,%0           ;REPRIME R0 WITH HIGHEST DIGIT
007352  005501                  ADC     %1              ;PROPOGATE CARRY
007354  010024                  MOV     %0,(4)+         ;SAVE R0
007356  010125                  MOV     %1,(5)+         ;SAVE R1
007360  020427  001036          CMP     %4,#LONUM+4     ;CHECK FOR DONE ENOUGH
007364  001344                  BNE     REPET2          ;BRANCH IF NOT DONE
007366  012605                  MOV     (6)+,%5         ;RESTORE R5
007370  012604                  MOV     (6)+,%4         ;RESTORE R4
007372  012603                  MOV     (6)+,%3         ;RESTORE R3
007374  012602                  MOV     (6)+,%2         ;RESTORE R2
007376  012601                  MOV     (6)+,%1         ;RESTORE R1
007400  012600                  MOV     (6)+,%0         ;RESTORE R0
007402  000207                  RTS     PC              ;RETURN
```

```
007404  010046          RANDM4: MOV     %0,-(6)         ;SAVE R0
007406  010146                  MOV     %1,-(6)         ;SAVE R1
007410  010246                  MOV     %2,-(6)         ;SAVE R2
007412  010346                  MOV     %3,-(6)         ;SAVE R3
007414  010446                  MOV     %4,-(6)         ;SAVE R4
007416  010546                  MOV     %5,-(6)         ;SAVE R5
007420  012704  001002          MOV     #LONUM,%4       ;SET UP LONUM POINTER
007424  012705  001012          MOV     #HINUM,%5       ;SET UP HINUM POINTER
007430  011400                  MOV     (4),%0          ;SET R0 WITH LOW
007432  011501                  MOV     (5),%1          ;SET R1 WITH HIGH
007434  012703  177771  REPET4: MOV     #-7,%3          ;SET SHIFT COUNT
007440  005002                  CLR     %2
007442  006300          SHIFT4: ASL     %0              ;SHIFT R0 LEFT AND
007444  006101                  ROL     %1              ;ROTATE CARRY INTO R1 AND
007446  006102                  ROL     %2              ;ROTATE CARRY INTO R2
007450  005203                  INC     %3              ;CHECK FOR DONE
007452  001373                  BNE     SHIFT4          ;CONTINUE SHIFT LOOP
007454  061402                  ADD     (4),%2          ;ADD NUMBER TO MAKE X 129
007456  005501                  ADC     %1              ;PROPOGATE CARRY
007460  061501                  ADD     (5),%1          ;ADD NUMBER TO MAKE X 129
007462  005502                  ADC     %2              ;PROPOGATE CARRY
007464  062700  001057          ADD     #1057,%0        ;ADD LOW CONSTANT
007470  005501                  ADC     %1              ;PROPOGATE CARRY
007472  005502                  ADC     %2              ;PROPOGATE CARRY
007474  062701  047401          ADD     #47401,%1       ;ADD HIGH CONSTANT
007500  005502                  ADC     %2              ;PROPOGATE CARRY
007502  062702  000006          ADD     #6,%2           ;ADD HIGHEST CONSTART
007506  060200                  ADD     %2,%0           ;REPRIME R0 WITH HIGHEST DIGIT
007510  005501                  ADC     %1              ;PROPOGATE CARRY
007512  010024                  MOV     %0,(4)+         ;SAVE R0
007514  010125                  MOV     %1,(5)+         ;SAVE R1
007516  020427  001012          CMP     %4,#LONUM+10    ;CHECK FOR DONE ENOUGH
007522  001344                  BNE     REPET4          ;BRANCH IF NOT DONE
007524  012605                  MOV     (6)+,%5         ;RESTORE R5
007526  012604                  MOV     (6)+,%4         ;RESTORE R4
007530  012603                  MOV     (6)+,%3         ;RESTORE R3
007532  012602                  MOV     (6)+,%2         ;RESTORE R2
007534  012601                  MOV     (6)+,%1         ;RESTORE R1
007536  012600                  MOV     (6)+,%0         ;RESTORE R0
007540  000207                  RTS     %7              ;RETURN
```

```
007542  032767  002000  170020  .TRP:   BIT     #2000,SWR
007550  001405                          BEQ     .ET
007552  012767  000207  001416          MOV     #BELL,.TYPE     ;TYPE A BELL
007560  000004  011176                  TYPE,   .TYPE
007564  005267  001414          .ET:    INC     ERRORS          ;COUNT THE NUMBER OF ERRORS
007570  032767  020000  167772          BIT     #20000,SWR      ;SKIP TYPEOUT IF SET
007576  001116                          BNE     NHEAD
007600  174267  171216                  STF     AC2,    ANS1    ;SAVE THE ANSWER TO BE SURE
007604  000004  011102                  TYPE,   RET
007610  000004  011102                  TYPE,   RET
007614  011646                          MOV     (6),-(6)        ;PUT ADDRESS OF INSTRUCTION ON STACK
007616  162716  000002                  SUB     #2,(6)
007622  117667  000000  001355          MOVB    @(6),   WORDS
007630  012605                          MOV     (6)+,TTY        ;TYPE (6)+ IN OCTAL
007632  004767  000546                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
007636  000004  011077                  TYPE,   SPACE+3
007642  012703  001002                  MOV     #LONUM, %3      ;SET UP POINTER
007646  004767  000174                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
007652  000004  011105                  TYPE,   $SIGN
007656  004767  000164                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
007662  000004  011130                  TYPE,   FPUAN
007666  004767  000154                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
007672  000004  011076                  TYPE,   SPACE+2
007676  016705  171140                  MOV     FPS,TTY         ;TYPE FPS IN OCTAL
007702  004767  000476                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
007706  105767  001274                  TSTB    WORDS           ;CHECK FOR STATUS ERROR
007712  100014                          BPL     .STAT           ;BRANCH IF NOT
007714  000004  011076                  TYPE,   SPACE+2
007720  016705  171120                  MOV     FEC,TTY         ;TYPE FEC IN OCTAL
007724  004767  000454                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
007730  000004  011076                  TYPE,   SPACE+2
007734  016705  171106                  MOV     FPC,TTY         ;TYPE FPC IN OCTAL
007740  004767  000440                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
007744  000004  011111          .STAT:  TYPE,   FORTAN
007750  004767  000072                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
007754  105767  001226          NOHEAD: TSTB    WORDS
007760  001425                          BEQ     NHEAD
007762  000004  011076                  TYPE,   SPACE+2
00776e  016705  171056                  MOV     $FPS,TTY        ;TYPE $FPS IN OCTAL
007772  004767  000406                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
007776  105767  001204                  TSTB    WORDS
010002  100014                          BPL     NHEAD
010004  000004  011076                  TYPE,   SPACE+2
010010  016705  171036                  MOV     $FEC,TTY        ;TYPE $FEC IN OCTAL
010014  004767  000364                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010020  000004  011076                  TYPE,   SPACE+2
010024  016705  171024                  MOV     $FPC,TTY        ;TYPE $FPC IN OCTAL
010030  004767  000350                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010034  005737  177570          NHEAD:  TST     @#SWR
010040  100001                          BPL     .+4
010042  000000                          HALT
010044  000002                          RTI
```

```
010046  032767  001000  167514  $TYPE:  BIT     #1000,  SWR     ;CHECK TTY FORMAT
010054  001007                          BNE     TYPEI
010056  105767  170766                  TSTB    $FPS
010062  100432                          BMI     TYPED
010064  004767  000076                  JSR     7,      TYPEF
010070  022323                  TYPEA:  CMP     (3)+,   (3)+    ;UP DATE THE TYPEOUT POINTER
010072  000207                          RTS     7

010074                          TYPEI:
010074  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
010076  004767  000302                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010102  000004  011100                  TYPE,   SPACE+4
010106  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
010110  004767  000270                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010114  105767  170730                  TSTB    $FPS
010120  100363                          BPL     TYPEA
010122  000004  011100                  TYPE,   SPACE+4
010126  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
010130  004767  000250                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010134  000004  011100                  TYPE,   SPACE+4
010140  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
010142  004767  000236                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010146  000207                          RTS     7

010150  012346                  TYPED:  MOV     (3)+,-(6)       ;GET WORD 1
010152  012346                          MOV     (3)+,-(6)       ;GET WORD 2
010154  012346                          MOV     (3)+,-(6)       ;GET WORD 3
010156  012346                          MOV     (3)+,-(6)       ;GET WORD 4
010160  012746  000022                  MOV     #18.,-(6)       ;CHAR COUNT
010164  000406                          BR      TYPE1
010166  012346                  TYPEF:  MOV     (3)+,-(6)       ;GET WORD 1
010170  012346                          MOV     (3)+,-(6)       ;GET WORD 2
010172  005046                          CLR     -(6)            ;CLEAR WORD 3
010174  005046                          CLR     -(6)
010176  012746  000010                  MOV     #8.,-(6)        ;CHAR COUNT
010202  004767  000104          TYPE1:  JSR     7,TY1           ;TYPE 1 BIT
010206  105766  000011                  TSTB    9.(6)           ;CHECK EXPONENT
010212  001001                          BNE     .+4             ;BRANCH ON NON-ZERO EXPONENT
010214  005116                          COM     (6)             ;FLAG ZERO EXPONENT
010216  000004  011100                  TYPE,   SPACE+4
010222  004767  000072                  JSR     7,TY2           ;TYPE 2 BITS
010226  004767  000074                  JSR     7,TY3           ;TYPE 3 BITS
010232  004767  000070                  JSR     7,TY3           ;TYPE 3 BITS
010236  000004  011100                  TYPE,   SPACE+4
010242  004767  000020                  JSR     7,TYH           ;TYPE 2 BITS
010246  004767  000054          TYPE2:  JSR     7,TY3           ;TYPE 3 BITS
010252  005316                          DEC     (6)             ;DONE?
010254  001374                          BNE     TYPE2
010256  022626                          CMP     (6)+,(6)+       ;RESTORE
010260  022626                          CMP     (6)+,(6)+       ;  THE
010262  005726                          TST     (6)+            ; STACK
010264  000207                          RTS     7
```

```
010266  005766  000002          TYH:    TST     2(6)            ;CHECK FOR ZERO EXPONENT FLAG
010272  100405                          BMI     TYZ             ;BRANCH ON ZERO EXPONENT
010274  012746  000001                  MOV     #1,-(6)         ;TYPE HIDDEN BIT AND ONE
010300  011667  000672                  MOV     (6),.TYPE       ;FUDGE HIDDEN BIT
010304  000414                          BR      TY+4
010306  005166  000002          TYZ:    COM     2(6)            ;GET RID OF ZERO EXPONENT FLAG
010312  012746  000001          TY1:    MOV     #1,-(6)         ;TYPE 1 BIT
010316  000405                          BR      TY
010320  012746  000002          TY2:    MOV     #2,-(6)         ;TYPE 2 BITS
010324  000402                          BR      TY
010326  012746  000003          TY3:    MOV     #3,-(6)         ;TYPE 3 BITS
010332  005067  000640          TY:     CLR     .TYPE
010336  006166  000006                  ROL     6(6)            ;SHIFT WORD 4
010342  006166  000010                  ROL     8.(6)           ;SHIFT WORD 3
010346  006166  000012                  ROL     10.(6)          ;SHIFT WORD 2
010352  006166  000014                  ROL     12.(6)          ;SHIFT WORD 1
010356  006167  000614                  ROL     .TYPE           ;GET IT
010362  005316                          DEC     (6)             ;DONE?
010364  001364                          BNE     TY+4
010366  052767  000060  000632          BIS     #'0,.TYPE       ;MAKE IT ASCII
010374  000004  011176                  TYPE,   .TYPE           ;TYPE IT
010400  005726                          TST     (6)+            ;RESTORE THE STACK
010402  000207                          RTS     7
```

```
010424  112767  000001  000130  PRINTR: MOVB    #1,.PR          ;SET ZERO FILL SWITCH
010432  000402                  BR      .+6
010434  005067  000122          PRINTS: CLR     .PR             ;SUPRESS LEADING ZERO'S
010440  112767  177772  000115          MOVB    #-6,.PR+1       ;SET COUNT
010446  010446                  MOV     R4,-(6          ;SAVE R4
010450  012704  010532                  MOV     #3$,R4          ;SET POINTER TO FIRST ASCII CHAR.
010454  105014                  CLRB    (4)             ;CLEAR FIRST BYTE
010456  000405                  BR      2$              ;ROTATE FIRST BIT
010460  105014          1$:     CLRB    (4)             ;CLEAR BYTE OF CHARACTER
010462  006105                  ROL     ;               ;ROTATE BIT INTO C
010464  106114                  ROLB    (4              ;PACK IT
010466  006105                  ROL     ;               ;ROTATE BIT INTO C
010470  106114                  ROLB    (4              ;PACK IT
010472  006105          2$:     ROL     ;               ;ROTATE BIT INTO C
010474  106114                  ROLB    (4              ;PACK IT
010476  105714                  TSTB    (4)
010500  001402                  BEQ     .+6
010502  105267  000054                  INCB    .PR
010506  105767  000050                  TSTB    .PR             ;CHECK FILL SWITCH
010512  001402                  BEQ     .+6
010514  152724  000060                  BISB    #'0,(4)+        ;MAKE INTO ASCII CHAR
010520  105267  000037                  INCB    .PR+1
010524  001355                  BNE     1$              ;REPEAT
010526  022704  010532                  CMP     #3$,R4
010532  001002                  BNE     .+6
010534  112724  000060                  MOVB    #'0,(4)+
010540  105014                  CLRB    (4)
010542  004567  000024                  JSR     R5,TYPE ;TYPE IT
010546  012604                  MOV     (6)+,R4         ;RESTORE R4
010550  000207                  RTS     PC

010552  000004          3$:     .BLKW   4
010562  000000          .PR:    0

010564  005267  000434  000000  ERROR:  INC     ERRORS          ;COUNT ERRORS
010570  132737  000001  000041          BITB    #1,@#41         ;AUTO MODE?
010576  001412                  BEQ     1$              ;NO!
010600  022767  000010  000416          CMP     #10.,ERRORS     ;TOO MANY?
010606  001006                  BNE     1$              ;NOT YET
010610  013700  000042                  MOV     @#42,R0         ;GET ADDRESS
010614  001403                  BEQ     1$              ;FORGET IT IF ZERO
010616  005037  000042                  CLR     @#42            ;ZAP 42
010622  004716                  JSR     PC,(6)          ;CALL THE MONITOR
010624  000207          1$:     RTS     PC              ;RETURN
```

C04


```
010606  012777  011002  000356  POWDWN: MOV     #ILLUP,@UPVEC   ;SET FOR FAST UP
010614  012777  000340  000352          MOV     #340,@UPVEC+2   ;PRIO:7
010622  170246                          STFPS   -(6)            ;GET THE FPS
010624  170011                          SETD
010626  174046                          STD     AC0,-(6)        ;SAVE AC'S
010630  174146                          STD     AC1,-(6)
010632  174246                          STD     AC2,-(6)
010634  174346                          STD     AC3,-(6)
010636  172404                          LDD     AC4,AC0
010640  174046                          STD     AC0,-(6)
010642  172405                          LDD     AC5,AC0
010644  174046                          STD     AC0,-(6)
010646  010046                          MOV     R0,-(6)         ;SAVE REGISTERS
010650  010146                          MOV     R1,-(6)
010652  010246                          MOV     R2,-(6)
010654  010346                          MOV     R3,-(6)
010656  010446                          MOV     R4,-(6)
010660  010546                          MOV     R5,-(6)
010662  010667  000264                  MOV     SP,SAVE6        ;SAVE SP
010666  012777  010676  000276          MOV     #POWUP,@UPVEC   ;SET UP VECTOR
010674  000000                          HALT

010676  016706  000250          POWUP:  MOV     SAVE6,SP        ;GET SP
010702  005001                          CLR     R1              ;WAIT LOOP FOR THE TTY
010704  005201                  1$:     INC     R1
010706  001376                          BNE     1$
010710  012605                          MOV     (6)+,R5         ;GET THE REGISTERS
010712  012604                          MOV     (6)+,R4
010714  012603                          MOV     (6)+,R3
010716  012602                          MOV     (6)+,R2
010720  012601                          MOV     (6)+,R1
010722  012600                          MOV     (6)+,R0
010724  170011                          SETD
010726  172426                          LDD     (6)+,AC0        ;RESTORE THE AC'S
010730  174005                          STD     AC0,AC5
010732  172426                          LDD     (6)+,AC0
010734  174004                          STD     AC0,AC4
010736  172726                          LDD     (6)+,AC3
010740  172626                          LDD     (6)+,AC2
010742  172526                          LDD     (6)+,AC1
010744  172426                          LDD     (6)+,AC0
010746  170126                          LDFPS   (6)+            ;RESTORE FPS
010750  012777  010606  000210          MOV     #POWDWN,@DWNVEC ;SET UP THE POWER DOWN VECTOR
010756  012777  000340  000204          MOV     #340,@DWNVEC+2
010764  000004  010770                  TYPE.   .+2             ;.ASCIZ <15><12>"POWER"
011000  000002                          RTI

011002  000000                  ILLUP:  HALT                    ;THE POWER UP SEQUENCE WAS STARTED
011004  000776                          BR      .-2             ; BEFORE THE POWER DOWN WAS COMPLETE
```

D04


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011006  010546                  .IOT:   MOV     TTY,-(6)        ;SAVE TTY
011012  017605  000002                  MOV     @2(6),TTY       ;GET ADDRESS TO BE TYPED
011014  105715                  1$:     TSTB    (TTY)           ;TERMINATOR?
011016  001406                          BEQ     2$
011020  112537  177566                  MOVB    (TTY)+,@#177566 ;LOAD AND TYPE THE CHARACTER
011024  105737  177564                  TSTB    @#177564        ;IS THE PRINTER READY
011030  100375                          BPL     .-4
011032  000770                          BR      1$              ;GET THE NEXT CHARACTER
011034  017646  000002          2$:     MOV     @2(6),-(6)      ;GET ADDRESS TO BE TYPED
011040  062766  000002  000004          ADD     #2,4(6)         ;ADD 2 TO THE ADDRESS
011046  022666  000002                  CMP     (6)+,2(6)       ;IS IT .+2?
011052  001006                          BNE     3$              ;NO
011054  062705  000002                  ADD     #2,TTY          ;ADD 2 TO THE ADDRESS
011060  042705  000001                  BIC     #1,TTY          ;BACK UP TO AN EVEN BYTE
011064  010566  000002                  MOV     TTY,2(6)        ;RESTORE ADDRESS
011070  012605                  3$:     MOV     (6)+,TTY        ;RESTORE TTY
011072  000002                          RTI                     ;RETURN

011074  005015  020040  000040  SPACE:  .ASCIZ  <15><12>"  "
011102  005015     000          RET:    .ASCIZ  <15><12>
011105     040  020057     000  $SIGN:  .ASCIZ  " / "
011111     015  020012  043040  FORTAN: .ASCIZ  <15><12>"  FORTRAN:  "
011116  051117  051124  047101
011124  020072  000040
011130  036440  005015  020040  FPLAN:  .ASCIZ  " =" <15><12>"  FPU:      "
011136  050106  035125  020040
011144  020040  020040     000
        011152                  .EVEN
011152  000000                  SAVE6:  0
011154  177564                  TPS:    177564                  ;TELEPRINTER STATUS REGISTER
011156  177566                  TPB:    177566                  ;TELEPRINTER DATA BUFFER
011160  172160                  FPTADR: 172160                  ;FLOATING POINT ADDRESS ON THE 11/20
011162  000244  000246          FPVECT: 244,246                 ;FLOATING POINT VECTOR ADDRESS
011166  000024  000026          DWNVEC: 24,26                   ;POWER DOWN VECTOR ADDRESS
011172  000024  000026          UPVEC:  24,26                   ;POWER UP VECTOR ADDRESS
011176  000000                  $TYPE:  0
011200  000000                  TRPB:   0
011202  000000                  LAD:    0                       ;LOOP ADDRESS
011204  000000                  ERRORS: 0                       ;ERROR COUNT
011206  000000                  WORDS:  0                       ;CONTAINS TYPEOUT INFO
011210  000377                  TIMES:  377                     ;ITERATION COUNT
        000001                  .END
```

```
AC0     =%000000   371#   478*   486    551*   559    626*   634    701*   709    778*   786    856*   864
                   938*   946    1018*  1026   1102*  1110   1177*  1185   1254*  1262   1334*  1342   1390
                   1894*  1895   1896*  1897   1919*  1920   1921*  1922   1926*
AC1     =%000001   372#   479*   487    552*   560    627*   635    702*   710    779*   787    857*   865
                   939*   947    1019*  1027   1103*  1111   1178*  1186   1255*  1263   1335*  1343   1391
                   1925*
AC2     =%000002   373#   486*   487*   493    513    517    523    559*   560*   566    586    590    596
                   634*   635*   641    663    667    673    709*   710*   716    738    742    750    [illegible]
                   [illegible]  793    813    817    828    864*   865*   871    891    895    910    [illegible]  [illegible]
                   953    975    979    990    1026*  1027*  1033   1055   1059   [illegible]  [illegible]  [illegible]  [illegible]
                   1139   1143   1149   1185*  1186*  1192   1214   1218   1226   1262*  1263*  1269   1291
                   1295   1306   1342*  1343*  1349   1371   1375   1390   1719   1892   1924*
AC3     =%000003   374#   480*   513    520    553*   586    595    628*   663    670    703*   738    747
                   780*   813    820    825    858*   891    900    907    940*   975    982    987    1020*
                   1055   1064   1071   1104*  1139   1146   1179*  1214   1223   1256*  1291   1298   1303
                   1336*  1371   1380   1387   1393   1923*
AC4     =%000004   375#   1894   1922*
AC5     =%000005   376#   1896   1920*
ANS1      001022   413#   493*   517*   518*   519*   520    523*   566*   590*   591*   592*   593*   594*
                   595    598*   641*   667*   668*   669*   670*   673*   716*   742*   743*   744*   745*
                   746*   747    750*   793*   817*   818*   819*   820    823*   824*   825    828*   871*
                   895*   896*   897*   898*   899*   900    903*   904*   905*   906*   907    910*   953*
                   979*   980*   981*   982    985*   986*   987    990*   1033*  1059*  1060*  1061*  1062*
                   1063*  1064   1067*  1068*  1069*  1070*  1071   1074*  1117*  1143*  1144*  1145*  1146
                   1149*  1192*  1218*  1219*  1220*  1221*  1222*  1223   1226*  1269*  1295*  1296*  1297*
                   1298   1301*  1302*  1303   1306*  1349*  1375*  1376*  1377*  1378*  1379*  1380   1393*
                   1384*  1385*  1386*  1387   1390*  1718*
ANS2      001032   418#   480    553    628    703    780    858    940    1020   1104   1179   1255   1336
                   1460*  1461*  1464*  1465*  1466*  1467*
BEG       001056   399    430#
BEGIN     001112   434    439#
BELL    = 000207   393#   1398   1713
DISPLA  = 177570   387#   1436*  1440*
DONE      006032   1396#
DUMMY   = 000000   388#   403    404    405    406    408    409    410    411    413    414    415    416
                   418    419    420    421
EMTVEC    011166   442*   443*   1928*  1929*  1969#
END1      001506   495    501    506    511    515    522    526#
END10     004230   1035   1041   1046   1049   1051   1054   1057   1066   1073   1077#
END11     004630   1119   1125   1130   1135   1138   1141   1148   1152#
END12     005140   1194   1200   1205   1210   1213   1216   1225   1229#
END13     005462   1271   1277   1282   1287   1290   1293   1300   1305   1309#
END14     006024   1351   1357   1362   1367   1370   1373   1382   1389   1393#
END2      002004   568    574    579    584    598    597    601#
END3      002302   643    649    654    659    662    665    672    676#
END4      002610   718    724    729    734    737    740    749    753#
END5      003120   795    801    806    811    815    822    827    831#
END6      003450   873    879    884    889    893    900    909    913#
END7      003770   955    961    966    971    974    977    984    989    993#
[illegible]        1875#
[illegible]        1715*  1875*  1978   1974#
[illegible]        1621   1624   1627#
[illegible]        489    497#
[illegible]        1029   1037#
[illegible]        1114   1121#
[illegible]        1189   1196#
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ERR13     005316         1266     1273#
ERR14     005640         1346     1353#
ERR2      001564          562      570#
ERR3      002162          637      645#
ERR4      002460          712      720#
ERR5      002766          789      797#
ERR6      003276          867      875#
ERR7      003626          949      957#
[illegible] [illegible]   424#     466*     503      539*     576      614*     651      689*     726      766*     803      [illegible]  [illegible]
                          926*     963     1006*    1043     1090*    1121*    1127     1165*    1196*    1202     1242*    1273*    1279
                         1322*    1353*    1359     1617*    1739
FLTERR    007210          450     1616#
[illegible] 011111       1744     1957#
[illegible] 001046        425#     467*     508      540*     581      615*     656      690*     731      767*     808      845*     886
                          927*     968     1007*    1048     1031*    1132     1166*    1207     1243*    1284     1323*    1364     [illegible]
FPS       001042          423#     455*     490*     491      498      526*     538*     563*     564      571      [illegible]  [illegible]  [illegible]
                          639      646      675*     688*     713*     714      721      753*     765*     790*     791      [illegible]  [illegible]
                          843*     868*     869      876      913*     925*     950*     951      959      993*    1005*    [illegible]  [illegible]
                         1038     1077*    1089*    1112*    1115     1122     1152*    1164*    1187*    1190     1137     1229*    [illegible]
                         1264*    1267     1274     1309*    1321*    1344*    1347     1354     1393*    1516*    173[illegible]
FPTADR    011160          436     1967#
FPVAN     011130         1731     1960#
FPVECT    011162          450*     451*    1968#
HINUM     001012          409#     479      552      627      702      779      857      939     1019     1103     1179     1255     1335
                         1454     1455     1456     1457     1476     1636     1677
HLT     = 104000          391#     494      500      505      510      524      567      573      578      583      599      [illegible]  [illegible]
                          653      658      674      717      723      728      733      751      [illegible]  800  905  [illegible]  [illegible]
                          872      878      883      898      911      954      960      965      970      991     [illegible]  [illegible]  [illegible]
                         1050     1075     1118     1124     1129     1134     1150     1193     [illegible]  1204  [illegible]  [illegible]  [illegible]
                         1276     1281     1286     1307     1350     1356     1361     1366     1391     1620     [illegible]
ICNT      001000          402#     452*    1421     1429     1431     1433*    1434*    1436     1439*    1440     1490     149[illegible]
[illegible]UP 011002     1896     1933#
[illegible] 006252       1426     1432     1439#
LAC       011202          453*     482*     555*     630*     705*     792*     863*     942*    1022*    1106*    1181*    1258*    1339*
                         1435*    1441     1443     1973#
LONUM     001002          403#     478      551      626      701      779      856      938     [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
                         1448     1449     1450     1451     1483     1494     1497     1498     1635     1560     [illegible]  [illegible]  [illegible]
[illegible] 001104        431      436#
NHEAD     010034         1717     1747     1752     1759#
NOHEAD    007754         1746#
NOP     = 000240          399#
OVER      006256         1422     1440#
PC      =%000007          370#     468*     541*     616*     691*     768*     846*     928*    1008*    1092*    1167*    [illegible]  [illegible]
                         1870*    1883*    1884*
POWDWN    010606          442     1886#    1928
POWUP     010676         1905     1908#
PRINTR    010404         1725     1735     1740     1743     1750     1755     1758     177[illegible]  [illegible]  1792  1795  [illegible]
PRINTS    010414         1843#
PS      = 177776          386#    1593
RANDM2    007246          468      616      768      928     1092     1244     1629#
RANDM4    007404          541      691      846     1008     1167     1324     1670#
REPET2    007276         1639#    1661
REPET4    007434         1680#    1702
RET       [illegible]    [illegible]  1720  1955#
RETAC     [illegible]    1492     1497     1505#
RET1      [illegible]     487#    1505
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FLOATING POINT DIVIDE EXERCISER
CROSS REFERENCE TABLE -- USER SYMBOLS

H04


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                                1852#  1854*  1936   1937*  1938   1940   1948*  1949*  1950   1951*
T[illegible]      010332        1821   1924   1826   1828#  1835
T[illegible]      010266        1808   1817#
TYPE    = 000004                 392#  1399   1714   1719   1720   1726   1729   1731   1733   1739   1741   1744   1748
                                1753   1756   1775   1780   1783   1803   1807   1837   1865   1930
TYPEA             010070        1769#  1779
T[illegible]      010150        1767   1788#
T[illegible]      010166        1768   1794#
T[illegible]      010[illegible] 1765   1772#
T[illegible]      010202        1793   1799#
T[illegible]      010246        1809#  1811
T[illegible]      010306        1818   1822#
T[illegible]      010312        1799   1823#
T[illegible]      010320        1804   1825#
T[illegible]      010326        1805   1806   1809   1827#
[illegible]       011172        1886*  1897*  1905*  1970#
[illegible]       011206        1723*  1736   1746   1751   1975#
[illegible]       006136         433*   441   1417#
$AC200            007114        1561   1571   1589#
$DVBZA            007172        1602   1608#
$DVBZO            007144        1527   1598#
$DVBZI            007160        1529   1604#
$DVC    = ******                 314#   545    695    850   1012   1171   1329   1550   1572
$DVP    = ******                 314#   472    620    772    932   1096   1249   1538   1562
$ERRA             006624         314#  1518#
$ERTS             007076        1533   1545   1581#
$FEC              001052         427#   463*   503    536*   576    611*   651    686*   726    763*   803    841*   881
                                 923*   963   1003*  1043   1087*  1127   1162*  1202   1239*  1279   1319*  1359   1479*
                                1555*  1579*  1609*  1754
$FPC              001054         428#   464*   508    537*   581    612*   656    687*   731    764*   808    842*   886
                                 924*   968   1004*  1049   1088*  1132   1163*  1207   1240*  1284   1320*  1364   1482*
                                1497*  1757
$FPS              001050         426#   462*   476    488    491    498    535*   549    561    564    571    610*   624
                                 636    639    646    661    685*   699    711    714    721    736    752*   [illegible] [illegible]
                                 791    798    840*   854    866    869    976    922*   936    948    951    958    973
                                1002*  1016   1028   1031   1038   1053   1086*  1100   1113   1115   1122   1127   1161*
                                1175   1188   1190   1197   1212   1238*  1252   1265   1267   1274   1289   1318*  1332
                                1345   1347   1354   1359   1470   1475*  1478*  1485   1491*  1499   1502   1544   1554*
                                1576   1578*  1580*  1608*  1618   1623   1749   1766   1779
$OVERA            007044        1566   1576#
$OVERC            006776        1523   1559#
$OVERI            007022        1525   1568#
$OVR[illegible]   007070        1577   1580#
$POLSH            006300         469    542    617    692    769    847    929   1009   1093   1168   1245   1325   1446#
                                1534   1546   1558   1562   1598   1604
$POP2X            006346         474    622    774    934   1098   1250   1460#  1541   1565   1601
$POP4X            006360         547    697    852   1014   1173   1330   1464#  1553   1575   1607
$P.2A             006312         470    618    770    930   1094   1246   1450#  1535   1559   1599
$P.2B             006334         471    619    771    931   1095   1247   1456#  1536   1560
$P.4A             006302         543    693    848   1010   1169   1326   1448#  1547   1569   1605
$P.4B             006324         544    694    849   1011   1170   1327   1454#  1548   1570
$SB200            007100        1537   1549   1583#
$SIGN             011106        1729   1956#
$TEP              006540        1471   1494#
$[illegible]      006556        1472   1498#
$[illegible]      006570        1500   1502#
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$TST      006402      473     546     621     696     773     851     933    1013    1097    1172    1249    1329    1470#
                     1540    1552    1564    1574    1600    1606
$TST[illegible]   006524     1474    1477    1486    1499#
$TST[illegible]   006536     1490    1492#
$TYPE     010046     1728    1730    1732    1745    1764#
$UNDRA    006760     1542    1554#
$UNDRC    006672     1519    1532#
$UNDR[illegible]   0067[illegible]     1521    1544#
$UNKER    0066[illegible]     1530#
$[illegible]   007[illegible]     1563    1573    1586#
$[illegible]   007[illegible]     1539    1551    1592#
$[illegible]   007[illegible]     1594    1596#
.       = 011212      395#    396     397#    401#    482     499     504     555     572     577     630     647     652
                      705     722     727     782     799     804     950     977     892     942     959     964    [illegible]
                     1039    1044    1106    1123    [illegible]  1191    1198    1203    [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
                     1360    1619    1760    1801    1842    195[illegible]   1960    1965    1872#   [illegible]  [illegible]  [illegible]  [illegible]#
.[illegible]     006140      448    1419#
.[illegible]     007554     1712    1715#
.[illegible]     011006      444    1936#
.[illegible]     010542     1841*   1843*   1844*   1858*   1859    1862*   1873#
.[illegible]     007744     1737    1744#
.[illegible]     007542      446    1711#
.[illegible]PE   011[illegible]6     1398*   1399    1713*   1714    1820*   1826*   1833*   1836*   1837    1971#
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DUMF	3618	1724	1734	1739	1742	1749	1754	1757	1772	1776	1791	1784
PRINT	3618	1930										
[illegible]	3618											
[illegible]	3618											
[illegible]	3618											
TEST	3618	1395	1713									

FLOATING POINT DIVIDE EXERCISER

CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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ADC      819   897   898   899   981  1061  1062  1063  1297  1377  1378  1379  1647  1649  1651
        1652  1654  1657  1688  1690  1692  1693  1695  1698
ADD      816   896   980  1060  1296  1376  1586  1589  1595  1646  1648  1650  1653  1655  1656
        1687  1689  1691  1694  1696  1697  1945  1948
ADS     1481  1496  1641  1682
BEQ      492   499   504   509   515   522   565   572   577   582   588   597   640   647   652
         657   665   672   715   722   727   732   740   749   792   799   804   809   815   822
         827   870   877   882   887   893   902   909   952   959   964   969   977   984   993
        1039  1044  1049  1057  1066  1073  1116  1123  1128  1133  1141  1148  1191  1198
        1203  1208  1216  1225  1268  1275  1280  1285  1293  1300  1305  1343  1355  1360  1365
        1373  1382  1389  1411  1420  1422  1430  1442  1519  1521  1523  1525  1527  1529  1533
        1545  1577  1594  1619  1712  1747  1857  1860  1877  1881  1939
        1949
BMI     1405  1475  1478  1491  1554  1578  1580  1608  1836
        1861
BNE      661   736   973  1053  1137  1212  1289  1369  1396  1401  1419  1425  1427  1470  1473
        1476  1532  1544  1576  1593  1618  1711  1716  1764
        1876
BPL      489   562   637   712   789   867   949  1029  1114  1189  1266  1346  1471  1624  1757
        1818
BNE      662   737   974  1054  1138  1213  1290  1370  1397  1402  1426  1428  1432  1472  1474
        1477  1645  1661  1686  1702  1717  1765  1801  1811  1835  1863  1865  1979  1911  1947
BR      1404  1486  1490  1500  1737  1752  1760  1779  1942
BR       434   495   501   506   511   568   574   579   584   643   649   654   659   718   724
         729   734   795   801   806   811   873   879   884   889   955   961   966   971  1035
        1041  1046  1051  1119  1125  1130  1135  1194  1200  1205  1210  1271  1277  1282  1287
        1351  1357  1362  1367  1542  1566  1602  1621  1793  1821  1824  1926  1842  1845  1934
        1943
BPCC     497   514   521   570   587   596   645   664   671   720   739   748   797   814   821
         826   875   892   901   908   957   976   983   988  1037  1056  1065  1072  1140  1147
        1215  1224  1292  1299  1304  1372  1381  1388
CLR      452   453   463   464   465   466   467   526   536   537   538   539   540   601   611
         612   613   614   615   676   686   687   688   689   690   753   763   764   765   766
         767   831   841   842   843   844   845   913   923   924   925   926   927   993  1003
        1004  1005  1006  1007  1077  1087  1088  1089  1090  1091  1152  1162  1163  1164  1165
        1166  1229  1239  1240  1241  1242  1243  1309  1319  1320  1321  1322  1323  1393  1400
        1640  1681  1796  1797  1828  1843  1882  1909
CLRB    1847  1849  1867
CMP      491   498   503   508   564   571   576   581   639   646   651   656   714   721   726
         731   791   798   803   808   869   876   881   886   951   958   963   968  1031  1039
        1043  1048  1115  1122  1127  1132  1190  1197  1202  1207  1267  1274  1279  1284  1347
        1354  1359  1364  1498  1501  1518  1520  1522  1524  1526  1528  1660  1701  1769  1812
        1813  1864  1878  1946
CMPB    1421  1431
CMPC     586   595   738   747   891   900   907  1055  1064  1071  1214  1223  1371  1380  1387
CMPF     513   520   663   670   813   820   825   975   982   987  1139  1146  1291  1298  1303
COM     1403  1802  1822
DEC     1495  1810  1834
DIVD     560   710   865  1027  1186  1343
DIVF     487   635   787   947  1111  1263
EMT      391
HALT     388   396  1530  1761  1906  1933
INC     1644  1685  1715  1875  1910
INCB    1434  1439  1858  1862
JCC      392
JMP      395  1416  1446  1452  1458  1492  1584  1587  1590  1596
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?SR	468	469	541	542	616	617	691	692	768	769	846	847	928	929	1008
	1009	1092	1093	1167	1168	1244	1245	1324	1325	1412	1534	1546	1558	1560	1538
	1604	1725	1728	1730	1732	1735	1740	1743	1745	1750	1755	1758	1768	1774	1777
	1782	1785	1799	1804	1805	1806	1808	1809	1883						
LDD	551	552	553	559	701	702	703	709	856	857	858	864	1018	1019	1020
	1026	1177	1178	1179	1185	1334	1335	1336	1342	1894	1896	1919	1921	1923	1924
	1925	1926													
LDF	[illegible]	479	480	486	626	627	628	634	778	779	780	786	938	939	940
	946	1102	1103	1104	1110	1254	1255	1256	1262						
LDFPS	[illegible]	481	550	554	625	629	700	704	777	781	855	859	937	941	1017
	1021	1101	1105	1176	1180	1253	1257	1333	1337	1927					
LDUB	1434														
MOV	430	431	433	436	439	440	441	442	443	444	445	446	447	448	449
	450	451	462	476	482	535	549	555	610	624	630	685	699	705	762
	776	782	840	854	860	922	936	942	1002	1016	1022	1086	1100	1106	1161
	1175	1181	1238	1252	1258	1318	1332	1338	1398	1406	1408	1410	1435	1436	1440
	1443	1448	1449	1450	1451	1454	1455	1456	1457	1460	1461	1464	1465	1466	1467
	1479	1482	1483	1484	1487	1488	1497	1555	1579	1609	1629	1630	1631	1632	1633
	1634	1635	1636	1637	1638	1639	1658	1659	1662	1663	1664	1665	1666	1667	1670
	1671	1672	1673	1674	1675	1676	1677	1678	1679	1680	1699	1700	1703	1704	1705
	1706	1707	1708	1713	1721	1724	1727	1734	1739	1742	1749	1754	1757	1773	1776
	1781	1784	1788	1789	1790	1791	1792	1794	1795	1798	1819	1820	1823	1825	1827
	1845	1846	1869	1880	1886	1887	1898	1899	1900	1901	1902	1903	1904	1905	1908
	1912	1913	1914	1915	1916	1917	1928	1929	1936	1937	1944	1950	1951		
MOVB	1423	1433	1480	1494	1723	1841	1844	1866	1940						
NOP	1413	1414	1415												
POL	1642	1643	1683	1684	1829	1830	1831	1832	1833	1850	1852	1854			
ROLB	1851	1853	1855												
RTI	1407	1409	1417	1437	1444	1627	1762	1931	1952						
RTS	1462	1468	1503	1556	1581	1610	1668	1709	1770	1786	1815	1839	1870	1884	
SBC	519	592	593	594	669	744	745	746	824	904	905	906	986	1068	1069
	1070	1145	1220	1221	1222	1302	1384	1385	1386						
SETD	1885	1918													
STD	566	590	598	716	742	750	871	895	910	1033	1059	1074	1192	1218	1226
	1349	1375	1390	1890	1891	1892	1893	1895	1897	1920	1922				
STF	493	517	523	641	667	673	793	817	828	953	979	990	1117	1143	1149
	1269	1295	1306	1718											
STFPS	490	563	638	713	790	868	950	1030	1112	1187	1264	1344	1616	1888	
STST	1121	1196	1273	1353	1617										
SUB	518	591	668	743	823	903	985	1067	1144	1219	1301	1383	1593	1592	1722
TRAP	390														
TST	432	488	561	636	711	788	866	948	1028	1113	1198	1265	1345	1441	1489
	1502	1623	1759	1814	1817	1838									
TSTB	1429	1485	1499	1736	1746	1751	1766	1778	1800	1856	1859	1938	1941		
.ASCIZ	1931	1954	1955	1956	1957	1960									
.ASECT	313														
.BLKW	1872														
.END	1977														
.EVEN	1931	1963													
.GLOBL	314														
.LIST	311	361	396	400	454	1395	1445	1628	1710	1763	1840	1895	1931	1935	
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M04

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.TITLE 312

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DEFAULT GLOBALS GENERATED: 0

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RUN-TIME RATIO: 130/22=5.9
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Spooler runtime 7 Seconds, 33 KCS, 183 disk reads, 3 disk writes, 51 pages