FP11

ADD and SUBTRACT EXERCISER

MD-11-DCFPS-D

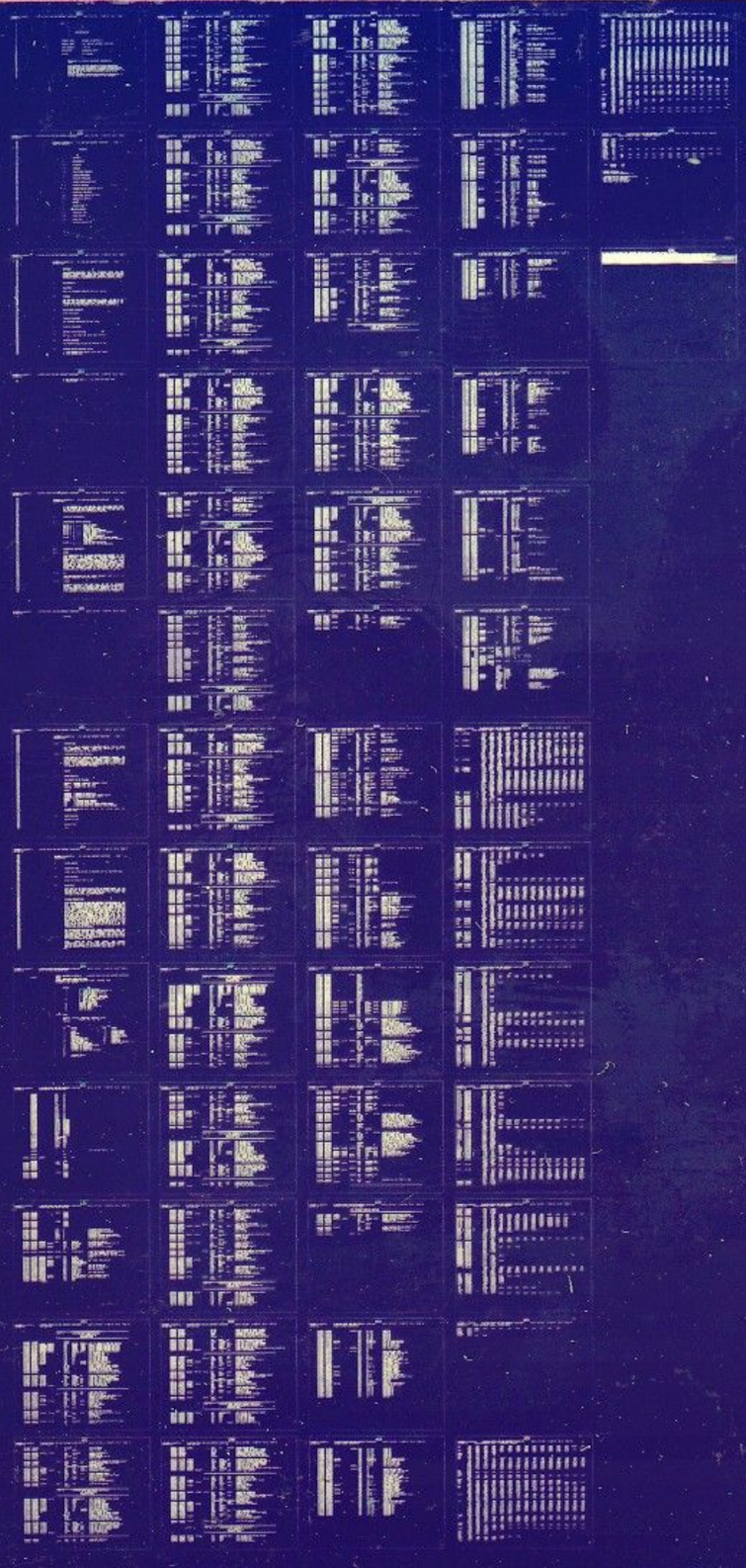
EP-DCFPS-D-DL-A

OCT 1976

digital

Made in U.S.A.

FICHE 1 OF 1



IDENTIFICATION

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

PRODUCT NAME: F11 ADD AND SUBTRACT EXERCISES

DATE CREATED: 1-NOV-72

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: KEN CHAPMAN

CONTENTS

MAINDEC-11-DCFPS-D-D FP11 ADD AND SUBTRACT EXERCISER PAGE 3
DESCRIPTION

1. ABSTRACT

THIS PROGRAM EXERCISES THE FP11 FLOATING POINT ADD AND SUBTRACT INSTRUCTIONS (ADDF, ADDD, SUBF, SUBD) 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 LNKX11 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.

3) SET SWITCHES (SEE 5.1.1) ALL DOWN FOR WORST CASE.
4) PRESS START.

5) THE PROGRAM WILL LOOP AND BELL WILL RING ONCE EVERY PASS.
6) THE DISPLAY ON THE 11/45 WILL SHOW THE ITERATION COUNT IN THE LEFT BYTE AND TEST NUMBER IN THE RIGHT. TO USE, 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 JB 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 THAT THE ITERATIONS WILL INCLUDE ONLY THE FP11 PORTION OF THE TEST.

5.2.2 HLT

THIS ROUTINE PRINTS OUT AN ERROR MESSAGE (SEE 5.1). 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

REACHED.

5.2.4 TRAPCATCHER

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

5.2.5 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 HLT OCCURS (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

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 ADD AND SUBTRACT 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 ADD AND SUBTRACT INSTRUCTIONS COULD CAUSE ERRORS.

.ENDR

```
                        .TITLE  MAINDEC-11-DCFPS-D      FLOATING POINT ADD AND SUBTRACT EXERCISER
:0000                   .ASECT
                        .GLOBL  $ADR,$ADD,$SBR,$SBD,$ERR
                        ;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 (-0)
                        ;        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
```

```
0000                    R0=     %0
0001                    R1=     %1
0002                    R2=     %2
0003                    R3=     %3
0004                    R4=     %4
0005                    R5=     %5
0005                    TTY=    %5
0006                    SP=     %6
0007                    PC=     %7
0000                    AC0=    %0
0001                    AC1=    %1
0002                    AC2=    %2
0003                    AC3=    %3
0004                    AC4=    %4
0005                    AC5=    %5
0400                    SW08=   000400
0000                    SW09=   001000
0000                    SW10=   002000
0000                    SW11=   004000
0000                    SW12=   010000
0000                    SW13=   020000
0000                    SW14=   040000
0000                    SW15=   100000
0770                    SWR=    177570
0776                    PS=     177776
0770                    DISPLAY=SWR
0000                    DUMMY=  HALT
0240                    NOP=    240
0000                    SCOPE=  TRAP
0000                    HLT=    EMT
0004                    TYPE=   IOT
0207                    BELL=   207

0000                    .=      0                       ;TRAP CATCHER FROM 0 - 776

0200                    .=      200

  67  000652                    JMP     BEG

0000                    . =     1000
0000                    ICNT:   0
0000                    LONUM:  DUMMY
0000                            DUMMY
0000                            DUMMY
0000                            DUMMY

0000                    HINUM:  DUMMY
0000                            DUMMY
0000                            DUMMY
0000                            DUMMY
```

```
                        ANS1:   DUMMY
                                DUMMY
                                DUMMY
                                DUMMY

                        ANS2:   DUMMY
                                DUMMY
                                DUMMY
                                DUMMY

                        FPS:    0                       ;FLOATING POINT STATUS
                        FEC:    0                       ;FLOATING EXCEPTION CODES
                        FPC:    0                       ;FLOATING PC
                        $FPS:   0                       ;FORTRAN FLOATING POINT STATUS
                        $FEC:   0                       ;FORTRAN FLOATING EXCEPTION CODES
                        $FPC:   0                       ;FORTRAN FLOATING PC

000600                  BEG:    MOV     #600,SP         ;** STACK AT 600 **
001104  000004                  MOV     #M1120,@#4      ;FIND OUT WHICH MACHINE THIS IS
177772                           TST     @#177772        ;IS PIRQ THERE?
000006  006004                   MOV     #6,YESRT        ;FUDGE IN RTT IF 11/45
                                 BR      BEGIN

011012  000010  M1120:  MOV     FPTADR,@#10             ;LOAD THE ILLEGAL INSTRUCTION VECTOR
                                                        ; WITH THE ADDRESS OF THE FPU.
                                                        ; THE FPU WILL HANDLE THE BAD OPCODES
000006  000004  BEGIN:  MOV     #6,@#4                  ;RESET 4
000600                  MOV     #600,SP
007106  000014          MOV     #YESRT,@#14             ;SET TRACE TRAP VECTOR
011546  010770          MOV     #POWDWN,@DWNVEC
000340  010764          MOV     #340,@DWNVEC+2
011746  000020          MOV     #.IOT,@#20              ;SET UP VECTOR 20
000030                  MOV     #30,R0                  ;SET R0 TO VECTOR 30
010502                  MOV     #.TRP,(0)+              ;SET EMT VECTOR
000340                  MOV     #340,(0)+
007110                  MOV     #.EMT,(0)+              ;SET TRAP VECTOR
000340                  MOV     #340,(0)
010150  010716          MOV     #FLTERR,@FPVECT         ;LOAD INTERUPT VECTOR
000340  010712          MOV     #340,@FPVECT+2          ;LOCK UP PROCESSOR
177560                  CLR     ICNT
010720                  CLR     LAD
```

```
                        ;*****************************************************************
                        ;TEST 1:        EXERCISE ADDF (ADD FLOATING)
                        ;                       ALL INTERUPTS ON
                        ;                       ROUNDING MODE
                        ;*****************************************************************

                                SCOPE
010617  010612                  MOVB    $PLUS,  $SIGN+1 ;PUT "+" SIGN IN TYPE-OUT ROUTINE
000000G 006376                  MOV     #$ADR,  .ERR1   ;SELECT PROPER FORTRAN ROUTINES
000000G 006424                  MOV     #$ADD,  .ERR2   ;SELECT PROPER FORTRAN ROUTINES
000000G 006530                  MOV     #$ADR,  .ERR3   ;SELECT PROPER FORTRAN ROUTINES
000000G 006546                  MOV     #$ADD,  .ERR4   ;SELECT PROPER FORTRAN ROUTINES
007400  177556                  MOV     #007400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
177554                          CLR     $FEC            ;CLR FORTRAN FEC
177552                          CLR     $FPC            ;CLR FORTRAN FPC
177534                          CLR     FPS             ;CLR FPU FPS BUFFER
177532                          CLR     FEC             ;CLR FPU FEC BUFFER
177530                          CLR     FPC             ;CLR FPU FPC BUFFER
006664                          JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
005722                          JSR     R4,     $POLSH  ;ENTER POLISH MODE
                                $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
                                $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
                                $ADR                    ;ADDRESS OF FORTRAN ADD
                                $TST                    ;DETERMINE THE CONDITION CODES
                                $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE
177504                          MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
040000                          LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
177426                          LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
177432                          LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
177446                          LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
007400                          LDFPS   #007400         ;TURN INTERUPTS ON
001376  010546                  MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

                                LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
                        RET1:   ADDF    AC1,    AC2     ;ADD AC1 BY AC2
177442                          TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
                                BMI     ERR1            ;BRANCH IF ERROR FLAG SET
177426                          STFPS   FPS             ;STORE FLOATING POINT STATUS
177422  177426                  CMP     FPS,    $FPS    ;CHECK FPS
                                BEQ     TST1            ;BRANCH IF OK
177372                          STF     AC2,    ANS1    ;SAVE FPU ANSWER
                                HLT+1                   ;FPS ERROR
                                BR      END1            ;SKIP COMPARE

                        ERR1:   CFCC                    ;WAIT FOR FPU TO FINISH
177400  177404                  CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
                                BEQ     .+6             ;BRANCH IF OK
                                HLT+377                 ;FPS ERROR
                                BR      END1            ;SKIP TO END

177366  177372                  CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
                                BEQ     .+6             ;BRANCH IF OK
```

```
                        HLT+377                 ;FEC IS WRONG
                        BR      END1            ;SKIP TO END

177354  177360          CMP     FPC,$FPC        ;CHECK FLOATING PC
                        BEQ     TST1            ;BRANCH IF OK
                        HLT+377                 ;WRONG ADDRESS IN FPC
                        BR      END1            ;SKIP TO END

                TST1:   CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
                        CFCC                    ;COPY FLOATING CONDITION CODES
                        BEQ     END1            ;ANSWERS CHECK
                        ;COMPENSATE FOR FORTRAN INACCURACIES.
177306                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
000001  177302         SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
177274                  SBC     ANS1
177270                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
                        CFCC                    ;COPY FLOATING CONDITION CODES
                        BEQ     END1            ;BRANCH IF OK
177260                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
                        HLT                     ;FPU AND FORTRAN DISAGREE

177272          END1:   CLR     FPS             ;CLR FPU FPS BUFFER
                        SCOPE

                ;*****************************************************************
                ;TEST 2:        EXERCISE ADDD (ADD DOUBLE PRECISION)
                ;                       ALL INTERUPTS ON
                ;                       ROUNDING MODE
                ;*****************************************************************

007600  177270          MOV     #007600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
177266                  CLR     $FEC            ;CLR FORTRAN FEC
177264                  CLR     $FPC            ;CLR FORTRAN FPC
177246                  CLR     FPS             ;CLR FPU FPS BUFFER
177244                  CLR     FEC             ;CLR FPU FEC BUFFER
177242                  CLR     FPC             ;CLR FPU FPC BUFFER
006534                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
005434                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
                        $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
                        $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
                        $ADD                    ;ADDRESS OF FORTRAN ADD
                        $TST                    ;DETERMINE THE CONDITION CODES
                        $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

177216                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
177140                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
177144                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
177160                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
007600                  LDFPS   #007600         ;TURN INTERUPTS ON
001664  010260          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

                        LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
                RET2:   ADDD    AC1,    AC2     ;ADD AC1 BY AC2
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                                        SFPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
                                        FPE2            ;BRANCH IF ERROR FLAG SET
                                        FPS             ;STORE FLOATING POINT STATUS
                                        FPS,    SFPS    ;CHECK FPS
                                        .+8             ;BRANCH IF OK
                                        AC2,    ANS1    ;SAVE FPU ANSWER
                                        .+4             ;FPS ERROR
                                        END2            ;SKIP TO END

                        ERR2:           CFCC            ;WAIT FOR FPU TO FINISH
                                        FPS,    SFPS    ;CHECK THE FLOATING POINT STATUS
                                        .+6             ;BRANCH IF OK
                                        HLT+377         ;FPS ERROR
                                        END2            ;SKIP TO END

001740  026767  177100  177104          CMP     FEC,SFEC        ;CHECK THE FLOATING EXCEPTION CODES
001746  001402                          BEQ     .+6             ;BRANCH IF OK
001750  104377                          HLT+377         ;FEC IS WRONG
001752  000433                          BR      END2            ;SKIP TO END

001754  026767  177066  177072          CMP     FPC,SFPC        ;CHECK FLOATING PC
001762  001402                          BEQ     TST2            ;BRANCH IF OK
001764  104377                          HLT+377         ;WRONG ADDRESS IN FPC
001766  000425                          BR      END2            ;SKIP TO END

001770  173702          TST2:           CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
001772  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
001774  001422                          BEQ     END2            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
001776  174267  177020                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
002002  162767  000001  177020          SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
002010  005667  177012                  SBC     ANS1+4
002014  005667  177004                  SBC     ANS1+2
002020  005667  176776                  SBC     ANS1
002024  173767  176772                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
002030  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
002032  001403                          BEQ     END2            ;BRANCH IF OK
002034  174267  176762                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
002040  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

002042  005067  176774          END2:   CLR     FPS             ;CLR FPU FPS BUFFER
002046  104400                          SCOPE

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

002050  012767  004400  176772          MOV     #004400,SFPS    ;SET IE BITS IN FORTRAN ANSWER
002056  005067  176770                  CLR     SFEC            ;CLR FORTRAN FEC
002062  005067  176766                  CLR     SFPC            ;CLR FORTRAN FPC
002066  005067  176750                  CLR     FPS             ;CLR FPU FPS BUFFER
002072  005067  176746                  CLR     FEC             ;CLR FPU FEC BUFFER
002076  005067  176744                  CLR     FPC             ;CLR FPU FPC BUFFER
002102  004767  006100                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
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002106  004467  005136                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
002112  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
002114  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
002116  000000G                         $ADR                    ;ADDRESS OF FORTRAN ADD
002120  007352                          $TST                    ;DETERMINE THE CONDITION CODES
002122  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

002124  016700  176720                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
002130  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
002134  172467  176642                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
002140  172567  176646                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
002144  172767  176662                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
002150  170127  004400                  LDFPS   #004400         ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
002154  012767  002162  007762          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

002162  172600                  RET3:   LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
002164  172201                          ADDF    AC1,    AC2     ;ADD AC1 BY AC2
002166  170267  176650                  STFPS   FPS             ;STORE FLOATING POINT STATUS
002172  026767  176644  176650          CMP     FPS,    $FPS    ;CHECK FPS
002200  001404                          BEQ     TST3            ;BRANCH IF OK
002202  174267  176614                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
002206  104001                          HLT+1                   ;FPS ERROR
002210  000425                          BR      END3            ;SKIP COMPARE

002212  032767  000002  176630  TST3:   BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
002220  001021                          BNE     END3            ;BRANCH IF OVERFLOW
002222  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
002224  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
002226  001416                          BEQ     END3            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
002230  174267  176566                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
002234  162767  000001  176562          SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
002242  005667  176554                  SBC     ANS1
002246  173767  176550                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
002252  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
002254  001403                          BEQ     END3            ;BRANCH IF OK
002256  174267  176540                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
002262  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

002264  005067  176552          END3:   CLR     FPS             ;CLR FPU FPS BUFFER
002270  104400                          SCOPE

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

002272  012767  004600  176550          MOV     #004600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
002300  005067  176546                  CLR     $FEC            ;CLR FORTRAN FEC
002304  005067  176544                  CLR     $FPC            ;CLR FORTRAN FPC
002310  005067  176526                  CLR     FPS             ;CLR FPU FPS BUFFER
002314  005067  176524                  CLR     FEC             ;CLR FPU FEC BUFFER
002320  005067  176522                  CLR     FPC             ;CLR FPU FPC BUFFER
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002324  004767  006C14              JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
002330  004467  004714              JSR     R4,     $POLSH  ;ENTER POLISH MODE
002334  007252                      $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
002336  007274                      $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
002340  000000G                     $ADD                    ;ADDRESS OF FORTRAN ADD
002342  007352                      $TST                    ;DETERMINE THE CONDITION CODES
002344  007330                      $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

002346  016700  176476              MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
002352  170127  040200              LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
002356  172467  176420              LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
002362  172567  176424              LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
002366  172767  176440              LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
002372  170127  004600              LDFPS   #004600         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
002376  012767  002404  007540      MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

002404  172600                      LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
002406  172201              RET4:   ADDD    AC1,    AC2     ;ADD AC1 BY AC2
002410  170267  176426              STFPS   FPS             ;STORE FLOATING POINT STATUS
002414  026767  176422  176426      CMP     FPS,    $FPS    ;CHECK FPS
002422  001404                      BEQ     TST4            ;BRANCH IF OK
002424  174267  176372              STD     AC2,    ANS1    ;SAVE FPU ANSWER
002430  104001                      HLT+1                   ;FPS ERROR
002432  000431                      BR      END4            ;SKIP COMPARE

002434  032767  000002  176406  TST4:   BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
002442  001025                      BNE     END4            ;BRANCH IF OVERFLOW
002444  173702                      CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
002446  170000                      CFCC                    ;COPY FLOATING CONDITION CODES
002450  001422                      BEQ     END4            ;ANSWERS CHECK
                                    ;COMPENSATE FOR FORTRAN INACCURACIES.
002452  174267  176344              STD     AC2,    ANS1    ;SAVE FPU ANSWER
002456  162767  000001  176344      SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
002464  005667  176336              SBC     ANS1+4
002470  005667  176330              SBC     ANS1+2
002474  005667  176322              SBC     ANS1
002500  173767  176316              CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
002504  170000                      CFCC                    ;COPY FLOATING CONDITION CODES
002506  001403                      BEQ     END4            ;BRANCH IF OK
002510  174267  176306              STD     AC2,    ANS1    ;SAVE FPU ANSWER
002514  104000                      HLT                     ;FPU AND FORTRAN DISAGREE

002516  005067  176320      END4:   CLR     FPS             ;CLR FPU FPS BUFFER
002522  104400                      SCOPE

                        ;*****************************************************************
                        ;TEST 5:        EXERCISE ADDF (ADD FLOATING)
                        ;                       ALL INTERUPTS ON
                        ;                       TRUNCATE MODE
                        ;*****************************************************************

002524  012767  007440  176316          MOV     #007440,$FPS    ;SET IE BITS IN FORTRAN ANSWER
002532  005067  176314                  CLR     $FEC            ;CLR FORTRAN FEC
002536  005067  176312                  CLR     $FPC            ;CLR FORTRAN FPC
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002542  005067  176274                  CLR     FPS             ;CLR FPU FPS BUFFER
002546  005067  176272                  CLR     FEC             ;CLR FPU FEC BUFFER
002552  005067  176270                  CLR     FPC             ;CLR FPU FPC BUFFER
002556  004767  005424                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
002562  004467  004462                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
002566  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
002570  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
002572  000000G                         $ADR                    ;ADDRESS OF FORTRAN ADD
002574  007352                          $TST                    ;DETERMINE THE CONDITION CODES
002576  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

002600  016700  176244                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
002604  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
002610  172467  176166                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
002614  172567  176172                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
002620  172767  176206                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
002624  170127  007440                  LDFPS   #007440         ;TURN INTERUPTS ON
002630  012767  002636  007306          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

002636  172600                  RET5:   LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
002640  172201                          ADDF    AC1,    AC2     ;ADD AC1 BY AC2
002642  005767  176202                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
002646  100412                          BMI     ERR5            ;BRANCH IF ERROR FLAG SET
002650  170267  176166                  STFPS   FPS             ;STORE FLOATING POINT STATUS
002654  026767  176162  176166          CMP     FPS,    $FPS    ;CHECK FPS
002662  001427                          BEQ     TST5            ;BRANCH IF OK
002664  174267  176132                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
002670  104001                          HLT+1                   ;FPS ERROR
002672  000455                          BR      END5            ;SKIP COMPARE

002674  170000                  ERR5:   CFCC                    ;WAIT FOR FPU TO FINISH
002676  026767  176140  176144          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
002704  001402                          BEQ     .+6             ;BRANCH IF OK
002706  104377                          HLT+377                 ;FPS ERROR
002710  000446                          BR      END5            ;SKIP TO END

002712  026767  176126  176132          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
002720  001402                          BEQ     .+6             ;BRANCH IF OK
002722  104377                          HLT+377                 ;FEC IS WRONG
002724  000440                          BR      END5            ;SKIP TO END

002726  026767  176114  176120          CMP     FPC,$FPC        ;CHECK FLOATING PC
002734  001402                          BEQ     TST5            ;BRANCH IF OK
002736  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
002740  000432                          BR      END5            ;SKIP TO END

002742  173702                  TST5:   CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
002744  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
002746  001427                          BEQ     END5            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
002750  174267  176046                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
002754  062767  000001  176042          ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
002762  005567  176034                  ADC     ANS1
002766  173767  176030                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
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002772  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
002774  001414                          BEQ     ENDS            ;BRANCH IF OK
002776  162767  000002  176020          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
003004  005667  176012                  SBC     ANS1
003010  173767  176006                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003014  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003016  001403                          BEQ     ENDS            ;BRANCH IF OK
003020  174267  175776                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003024  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

003026  005067  176010          ENDS:   CLR     FPS             ;CLR FPU FPS BUFFER
003032  104400                          SCOPE


                        ;*************************************************************************
                        ;TEST 6:        EXERCISE ADDD (ADD DOUBLE PRECISION)
                        ;                       ALL INTERUPTS ON
                        ;                       TRUNCATE MODE
                        ;*************************************************************************

003034  012767  007640  176006          MOV     #007640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
003042  005067  176004                  CLR     $FEC            ;CLR FORTRAN FEC
003046  005067  176002                  CLR     $FPC            ;CLR FORTRAN FPC
003052  005067  175764                  CLR     FPS             ;CLR FPU FPS BUFFER
003056  005067  175762                  CLR     FEC             ;CLR FPU FEC BUFFER
003062  005067  175760                  CLR     FPC             ;CLR FPU FPC BUFFER
003066  004767  005252                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
003072  004467  004152                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
003076  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
003100  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
003102  0000006                         $ADD                    ;ADDRESS OF FORTRAN ADD
003104  007352                          $TST                    ;DETERMINE THE CONDITION CODES
003106  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

003110  016700  175734                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
003114  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
003120  172467  175656                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
003124  172567  175662                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
003130  172767  175676                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
003134  170127  007640                  LDFPS   #007640         ;TURN INTERUPTS ON
003140  012767  003146  006776          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

003146  172600                  RET6:   LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
003150  172201                          ADDD    AC1,    AC2     ;ADD AC1 BY AC2
003152  005767  175672                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
003156  100412                          BMI     ERR6            ;BRANCH IF ERROR FLAG SET
003160  170267  175656                  STFPS   FPS             ;STORE FLOATING POINT STATUS
003164  026767  175652  175656          CMP     FPS,    $FPS    ;CHECK FPS
003172  001427                          BEQ     TST6            ;BRANCH IF OK
003174  174267  175622                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003200  104001                          HLT+1                   ;FPS ERROR
003202  000465                          BR      END6            ;SKIP TO END

003204  170000                  ERR6:   CFCC                    ;WAIT FOR FPU TO FINISH
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003206  026767  175630  175634          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
003214  001402                          BEQ     .+6             ;BRANCH IF OK
003216  104377                          HLT+377                 ;FPS ERROR
003220  000456                          BR      END6            ;SKIP TO END

003222  026767  175616  175622          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
003230  001402                          BEQ     .+6             ;BRANCH IF OK
003232  104377                          HLT+377                 ;FEC IS WRONG
003234  000450                          BR      END6            ;SKIP TO END

003236  026767  175604  175610          CMP     FPC,$FPC        ;CHECK FLOATING PC
003244  001402                          BEQ     TST6            ;BRANCH IF OK
003246  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
003250  000442                          BR      END6            ;SKIP TO END

003252  173702                  TST6:   CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
003254  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003256  001437                          BEQ     END6            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
003260  174267  175536                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003264  062767  000001  175536          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
003272  005567  175530                  ADC     ANS1+4
003276  005567  175522                  ADC     ANS1+2
003302  005567  175514                  ADC     ANS1
003306  173767  175510                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003312  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003314  001420                          BEQ     END6            ;BRANCH IF OK
003316  162767  000002  175504          SUB     #2,     ANS1+6  ;DECREMENT FPU ANSWER
003324  005667  175476                  SBC     ANS1+4
003330  005667  175470                  SBC     ANS1+2
003334  005667  175462                  SBC     ANS1
003340  173767  175456                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003344  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003346  001403                          BEQ     END6            ;BRANCH IF OK
003350  174267  175446                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003354  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

003356  005067  175460          END6:   CLR     FPS             ;CLR FPU FPS BUFFER
003362  104400                          SCOPE


                                ;*****************************************************************
                                ;TEST 7:        EXERCISE ADDF (ADD FLOATING)
                                ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF.
                                ;                       TRUNCATE MODE
                                ;*****************************************************************

003364  012767  004440  175456          MOV     #004440,$FPS    ;SET IE BITS IN FORTRAN ANSWER
003372  005067  175454                  CLR     $FEC            ;CLR FORTRAN FEC
003376  005067  175452                  CLR     $FPC            ;CLR FORTRAN FPC
003402  005067  175434                  CLR     FPS             ;CLR FPU FPS BUFFER
003406  005067  175432                  CLR     FEC             ;CLR FPU FEC BUFFER
003412  005067  175430                  CLR     FPC             ;CLR FPU FPC BUFFER
003416  004767  004564                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
003422  004467  003622                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
003426  007202                          $P.2A                   ;PUSH 2 WORDS ON STACK  LOW
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003430  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
003432  0000006                         $ADR                    ;ADDRESS OF FORTRAN ADD
003434  007352                          $TST                    ;DETERMINE THE CONDITION CODES
003436  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

003440  016700  175404                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
003444  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
003450  172467  175326                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
003454  172567  175332                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
003460  172767  175346                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
003464  170127  004440                  LDFPS   #004440         ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
003470  012767  003476  006446          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

003476  172600                  RE7:    LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
003500  172201                          ADDF    AC1,    AC2     ;ADD AC1 BY AC2
003502  170267  175334                  STFPS   FPS             ;STORE FLOATING POINT STATUS
003506  026767  175330  175334          CMP     FPS,    $FPS    ;CHECK FPS
003514  001404                          BEQ     TST7            ;BRANCH IF OK
003516  174267  175300                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003522  104001                          HLT+1                   ;FPS ERROR
003524  000436                          BR      END7            ;SKIP COMPARE

003526  032767  000002  175314  TST7:   BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
003534  001032                          BNE     END7            ;BRANCH IF OVERFLOW
003536  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
003540  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003542  001427                          BEQ     END7            ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
003544  174267  175252                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003550  062767  000001  175246          ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
003556  005567  175240                  ADC     ANS1
003562  173767  175234                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003566  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003570  001414                          BEQ     END7            ;BRANCH IF OK
003572  162767  000002  175224          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
003600  005667  175216                  SBC     ANS1
003604  173767  175212                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
003610  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
003612  001403                          BEQ     END7            ;BRANCH IF OK
003614  174267  175202                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
003620  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

003622  005067  175214          END7:   CLR     FPS             ;CLR FPU FPS BUFFER
003626  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 10:       EXERCISE ADDD (ADD DOUBLE PRECISION)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF
                        ;                       TRUNCATE MODE
                        ;*****************************************************************

003630  012767  004640  175212          MOV     #004640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
003636  005067  175210                  CLR     $FEC            ;CLR FORTRAN FEC
003642  005067  175206                  CLR     $FPC            ;CLR FORTRAN FPC
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003646  005067  175170                  CLR     FPS             ;CLR FPU FPS BUFFER
003652  005067  175166                  CLR     FEC             ;CLR FPU FEC BUFFER
003656  005067  175164                  CLR     FPC             ;CLR FPU FPC BUFFER
003662  004767  004456                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
003666  004467  003356                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
003672  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
003674  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
003676  000000G                         $ADD                    ;ADDRESS OF FORTRAN ADD
003700  007352                          $TST                    ;DETERMINE THE CONDITION CODES
003702  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

003704  016700  175140                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
003710  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
003714  172467  175062                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
003720  172567  175066                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
003724  172767  175102                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
003730  170127  004640                  LDFPS   #004640         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
003734  012767  003742  006202          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

003742  172600                  RET10:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
003744  172201                          ADDD    AC1,    AC2     ;ADD AC1 BY AC2
003746  170267  175070                  STFPS   FPS             ;STORE FLOATING POINT STATUS
003752  026767  175064  175070          CMP     FPS,    $FPS    ;CHECK FPS
003760  001404                          BEQ     TST10           ;BRANCH IF OK
003762  174267  175034                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
003766  104001                          HLT+1                   ;FPS ERROR
003770  000446                          BR      END10           ;SKIP COMPARE

003772  032767  000002  175050  TST10:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
004000  001042                          BNE     END10           ;BRANCH IF OVERFLOW
004002  173702                          CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
004004  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004006  001437                          BEQ     END10           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
004010  174267  175006                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004014  062767  000001  175006          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
004022  005567  175000                  ADC     ANS1+4
004026  005567  174772                  ADC     ANS1+2
004032  005567  174764                  ADC     ANS1
004036  173767  174760                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004042  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004044  001420                          BEQ     END10           ;BRANCH IF OK
004046  162767  000002  174754          SUB     #2,     ANS1+6  ;DECREMENT FPU ANSWER
004054  005667  174746                  SBC     ANS1+4
004060  005667  174740                  SBC     ANS1+2
004064  005667  174732                  SBC     ANS1
004070  173767  174726                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004074  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004076  001403                          BEQ     END10           ;BRANCH IF OK
004100  174267  174716                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004104  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

004106  005067  174730          END10:  CLR     FPS             ;CLR FPU FPS BUFFER
004112  104400                          SCOPE
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                        ;*****************************************************************
                        ;TEST 11:       EXERCISE SUBF (SUBTRACT FLOATING)
                        ;                       ALL INTERUPTS ON
                        ;                       ROUNDING MODE
                        ;*****************************************************************

004114  116767  005732  005724          MOVB    $MINUS, $SIGN+1 ;PUT "-" SIGN IN TYPE-OUT ROUTINE
004122  012767  000000G 003510          MOV     #$SBR,  .ERR1   ;SELECT PROPER FORTRAN ROUTINES
004130  012767  000000G 003536          MOV     #$SBD,  .ERR2   ;SELECT PROPER FORTRAN ROUTINES
004136  012767  000000G 003642          MOV     #$SBR,  .ERR3   ;SELECT PROPER FORTRAN ROUTINES
004144  012767  000000G 003660          MOV     #$SBD,  .ERR4   ;SELECT PROPER FORTRAN ROUTINES
004152  012767  007400  174670          MOV     #007400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
004160  005067  174666                  CLR     $FEC            ;CLR FORTRAN FEC
004164  005067  174664                  CLR     $FPC            ;CLR FORTRAN FPC
004170  005067  174646                  CLR     FPS             ;CLR FPU FPS BUFFER
004174  005067  174644                  CLR     FEC             ;CLR FPU FEC BUFFER
004200  005067  174642                  CLR     FPC             ;CLR FPU FPC BUFFER
004204  004767  003776                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
004210  004467  003034                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
004214  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
004216  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
004220  000000G                         $SBR                    ;ADDRESS OF FORTRAN SUBTRACT
004222  007352                          $TST                    ;DETERMINE THE CONDITION CODES
004224  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE
004226  016700  174616                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
004232  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
004236  172467  174540                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
004242  172567  174544                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
004246  172767  174560                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
004252  170127  007400                  LDFPS   #007400         ;TURN INTERUPTS ON
004256  012767  004264  005660          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

004264  172600                  RET11:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
004266  173201                          SUBF    AC1,    AC2     ;SUBTRACT AC1 BY AC2
004270  005767  174554                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
004274  100412                          BMI     ERR11           ;BRANCH IF ERROR FLAG SET
004276  170267  174540                  STFPS   FPS             ;STORE FLOATING POINT STATUS
004302  026767  174534  174540          CMP     FPS,    $FPS    ;CHECK FPS
004310  001427                          BEQ     TST11           ;BRANCH IF OK
004312  174267  174504                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004316  104001                          HLT+1                   ;FPS ERROR
004320  000444                          BR      END11           ;SKIP COMPARE

004322  170000                  ERR11:  CFCC                    ;WAIT FOR FPU TO FINISH
004324  026767  174512  174516          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
004332  001402                          BEQ     .+6             ;BRANCH IF OK
004334  104377                          HLT+377                 ;FPS ERROR
004336  000435                          BR      END11           ;SKIP TO END

004340  026767  174500  174504          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
004346  001402                          BEQ     .+6             ;BRANCH IF OK
004350  104377                          HLT+377                 ;FEC IS WRONG
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004352  000427                          BR      END11           ;SKIP TO END

004354  026767  174466  174472         CMP     FPC,$FPC        ;CHECK FLOATING PC
004362  001402                          BEQ     TST11           ;BRANCH IF OK
004364  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
004366  000421                          BR      END11           ;SKIP TO END

004370  173702                  TST11:  CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
004372  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004374  001416                          BEQ     END11           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
004376  174267  174420                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004402  162767  000001  174414          SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
004410  005667  174406                  SBC     ANS1
004414  173767  174402                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004420  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004422  001403                          BEQ     END11           ;BRANCH IF OK
004424  174267  174372                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
004430  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

004432  005067  174404          END11:  CLR     FPS             ;CLR FPU FPS BUFFER
004436  104400                          SCOPE

                                ;*******************************************************************
                                ;TEST 12:       EXERCISE SUBD (SUBTRACT DOUBLE PRECISION)
                                ;                       ALL INTERUPTS ON
                                ;                       ROUNDING MODE
                                ;*******************************************************************

004440  012767  007600  174402          MOV     #007600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
004446  005067  174400                  CLR     $FEC            ;CLR FORTRAN FEC
004452  005067  174376                  CLR     $FPC            ;CLR FORTRAN FPC
004456  005067  174360                  CLR     FPS             ;CLR FPU FPS BUFFER
004462  005067  174356                  CLR     FEC             ;CLR FPU FEC BUFFER
004466  005067  174354                  CLR     FPC             ;CLR FPU FPC BUFFER
004472  004767  003646                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
004476  004467  002546                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
004502  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
004504  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
004506  000000G                         $SBD                    ;ADDRESS OF FORTRAN SUBTRACT
004510  007352                          $TST                    ;DETERMINE THE CONDITION CODES
004512  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

004514  016700  174330                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
004520  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
004524  172467  174252                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
004530  172567  174256                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
004534  172767  174272                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
004540  170127  007600                  LDFPS   #007600         ;TURN INTERUPTS ON
004544  012767  004552  005372          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

004552  172600                  RET12:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
004554  173201                          SUBD    AC1,    AC2     ;SUBTRACT AC1 BY AC2
004556  005767  174266                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
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004562  100412                          BMI     ERR12           ;BRANCH IF ERROR FLAG SET
004564  170267  174252                  STFPS   FPS             ;STORE FLOATING POINT STATUS
004570  026767  174246  174252          CMP     FPS,    $FPS    ;CHECK FPS
004576  001427                          BEQ     TST12           ;BRANCH IF OK
004600  174267  174216                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004604  104001                          HLT+1                   ;FPS ERROR
004606  000450                          BR      END12           ;SKIP TO END

004610  170000                  ERR12:  CFCC                    ;WAIT FOR FPU TO FINISH
004612  026767  174224  174230          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
004620  001402                          BEQ     .+6             ;BRANCH IF OK
004622  104377                          HLT+377                 ;FPS ERROR
004624  000441                          BR      END12           ;SKIP TO END

004626  026767  174212  174216          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
004634  001402                          BEQ     .+6             ;BRANCH IF OK
004636  104377                          HLT+377                 ;FEC IS WRONG
004640  000433                          BR      END12           ;SKIP TO END

004642  026767  174200  174204          CMP     FPC,$FPC        ;CHECK FLOATING PC
004650  001402                          BEQ     TST12           ;BRANCH IF OK
004652  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
004654  000425                          BR      END12           ;SKIP TO END

004656  173702                  TST12:  CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
004660  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004662  001422                          BEQ     END12           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
004664  174267  174132                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004670  162767  000001  174132          SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
004676  005667  174124                  SBC     ANS1+4
004702  005667  174116                  SBC     ANS1+2
004706  005667  174110                  SBC     ANS1
004712  173767  174104                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
004716  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
004720  001403                          BEQ     END12           ;BRANCH IF OK
004722  174267  174074                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
004726  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

004730  005067  174106          END12:  CLR     FPS             ;CLR FPU FPS BUFFER
004734  104400                          SCOPE

                                ;*****************************************************************
                                ;TEST 13:       EXERCISE SUBF (SUBTRACT FLOATING)
                                ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF.
                                ;                       ROUNDING MODE
                                ;*****************************************************************

004736  012767  004400  174104          MOV     #004400,$FPS    ;SET IE BITS IN FORTRAN ANSWER
004744  005067  174102                  CLR     $FEC            ;CLR FORTRAN FEC
004750  005067  174100                  CLR     $FPC            ;CLR FORTRAN FPC
004754  005067  174062                  CLR     FPS             ;CLR FPU FPS BUFFER
004760  005067  174060                  CLR     FEC             ;CLR FPU FEC BUFFER
004764  005067  174056                  CLR     FPC             ;CLR FPU FPC BUFFER
004770  004767  003212                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
004774  004467  002250                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
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005000  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
005002  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
005004  000000G                         $SBR                    ;ADDRESS OF FORTRAN SUBTRACT
005006  007352                          $TST                    ;DETERMINE THE CONDITION CODES
005010  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

005012  016700  174032                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
005016  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
005022  172467  173754                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
005026  172567  173760                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
005032  172767  173774                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
005036  170127  004400                  LDFPS   #004400         ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
005042  012767  005050  005074          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

005050  172600                  RET13:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
005052  173201                          SUBF    AC1,    AC2     ;SUBTRACT AC1 BY AC2
005054  170267  173762                  STFPS   FPS             ;STORE FLOATING POINT STATUS
005060  026767  173756  173762          CMP     FPS,    $FPS    ;CHECK FPS
005066  001404                          BEQ     TST13           ;BRANCH IF OK
005070  174267  173726                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005074  104001                          HLT+1                   ;FPS ERROR
005076  000425                          BR      END13           ;SKIP COMPARE

005100  032767  000002  173742  TST13:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
005106  001021                          BNE     END13           ;BRANCH IF OVERFLOW
005110  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
005112  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005114  001416                          BEQ     END13           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
005116  174267  173700                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005122  162767  000001  173674          SUB     #1,     ANS1+2  ;DECREMENT FPU ANSWER
005130  005667  173666                  SBC     ANS1
005134  173767  173662                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005140  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005142  001403                          BEQ     END13           ;BRANCH IF OK
005144  174267  173652                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005150  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

005152  005067  173664          END13:  CLR     FPS             ;CLR FPU FPS BUFFER
005156  104400                          SCOPE

                        ;*************************************************************************
                        ;TEST 14:       EXERCISE SUBD (SUBTRACT DOUBLE PRECISION)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF
                        ;                       ROUNDING MODE
                        ;*************************************************************************

005160  012767  004600  173662          MOV     #004600,$FPS    ;SET IE BITS IN FORTRAN ANSWER
005166  005067  173660                  CLR     $FEC            ;CLR FORTRAN FEC
005172  005067  173656                  CLR     $FPC            ;CLR FORTRAN FPC
005176  005067  173640                  CLR     FPS             ;CLR FPU FPS BUFFER
005202  005067  173636                  CLR     FEC             ;CLR FPU FEC BUFFER
005206  005067  173634                  CLR     FPC             ;CLR FPU FPC BUFFER
005212  004767  003126                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
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005216  004467  002026                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
005222  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
005224  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
005226  000000G                         $SBD                    ;ADDRESS OF FORTRAN SUBTRACT
005230  007352                          $TST                    ;DETERMINE THE CONDITION CODES
005232  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

005234  016700  173610                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
005240  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
005244  172467  173532                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
005250  172567  173536                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
005254  172767  173552                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
005260  170127  004600                  LDFPS   #004600         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
005264  012767  005272  004652          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

005272  172600                  RET14:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
005274  173201                          SUBD    AC1,    AC2     ;SUBTRACT AC1 BY AC2
005276  170267  173540                  STFPS   FPS             ;STORE FLOATING POINT STATUS
005302  026767  173534  173540          CMP     FPS,    $FPS    ;CHECK FPS
005310  001404                          BEQ     TST14           ;BRANCH IF OK
005312  174267  173504                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005316  104001                          HLT+1                   ;FPS ERROR
005320  000431                          BR      END14           ;SKIP COMPARE

005322  032767  000002  173520  TST14:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
005330  001025                          BNE     END14           ;BRANCH IF OVERFLOW
005332  173702                          CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
005334  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005336  001422                          BEQ     END14           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
005340  174267  173456                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005344  162767  000001  173456          SUB     #1,     ANS1+6  ;DECREMENT FPU ANSWER
005352  005667  173450                  SBC     ANS1+4
005356  005667  173442                  SBC     ANS1+2
005362  005667  173434                  SBC     ANS1
005366  173767  173430                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005372  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005374  001403                          BEQ     END14           ;BRANCH IF OK
005376  174267  173420                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
005402  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

005404  005067  173432          END14:  CLR     FPS             ;CLR FPU FPS BUFFER
005410  104400                          SCOPE

                        ;*****************************************************************************
                        ;TEST 15:       EXERCISE SUBF (SUBTRACT FLOATING)
                        ;                       ALL INTERUPTS ON
                        ;                       TRUNCATE MODE
                        ;*****************************************************************************

005412  012767  007440  173430          MOV     #007440,$FPS    ;SET IE BITS IN FORTRAN ANSWER
005420  005067  173426                  CLR     $FEC            ;CLR FORTRAN FEC
005424  005067  173424                  CLR     $FPC            ;CLR FORTRAN FPC
005430  005067  173406                  CLR     FPS             ;CLR FPU FPS BUFFER
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                                        ;CLR FPU FEC BUFFER
                                        ;CLR FPU FPC BUFFER
                        RANDM2          ;GET RANDOM INPUT DATA
                        $POLSH          ;ENTER POLISH MODE
                                        ;PUSH 2 WORDS ON STACK  LONUM
                                        ;PUSH 2 WORDS ON STACK  HINUM
                                        ;ADDRESS OF FORTRAN SUBTRACT
                                        ;DETERMINE THE CONDITION CODES
                                        ;POP 2 WORDS AND EXIT POLISH MODE

005466  016700  173356          MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
005472  012700  040000          LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
005476  172667  173300          LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
005502  172567  173304          LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
005506  172767  173320          LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
005512  170127  007440          LDFPS   #007440         ;TURN INTERUPTS ON
005516  012767  005524  004420  MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

005524  172600          RET15:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
005526  173201                  SUBF    AC1,    AC2     ;SUBTRACT AC1 BY AC2
005530  005767  173314          TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
005534  100412                  BMI     ERR15           ;BRANCH IF ERROR FLAG SET
005536  170267  173300          STFPS   FPS             ;STORE FLOATING POINT STATUS
005542  026767  173274  173300  CMP     FPS,    $FPS    ;CHECK FPS
005550  001427                  BEQ     TST15           ;BRANCH IF OK
005552  174267  173244          STF     AC2,    ANS1    ;SAVE FPU ANSWER
005556  104001                  HLT+1                   ;FPS ERROR
005560  000455                  BR      END15           ;SKIP COMPARE

005562  170000          ERR15:  CFCC                    ;WAIT FOR FPU TO FINISH
005564  026767  173252  173256  CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
005572  001402                  BEQ     .+6             ;BRANCH IF OK
005574  104377                  HLT+377                 ;FPS ERROR
005576  000446                  BR      END15           ;SKIP TO END

005600  026767  173240  173244  CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
005606  001402                  BEQ     .+6             ;BRANCH IF OK
005610  104377                  HLT+377                 ;FEC IS WRONG
005612  000440                  BR      END15           ;SKIP TO END

005614  026767  173226  173232  CMP     FPC,$FPC        ;CHECK FLOATING PC
005622  001402                  BEQ     TST15           ;BRANCH IF OK
005624  104377                  HLT+377                 ;WRONG ADDRESS IN FPC
005626  000432                  BR      END15           ;SKIP TO END

005630  173702          TST15:  CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
005632  170000                  CFCC                    ;COPY FLOATING CONDITION CODES
005634  001427                  BEQ     END15           ;ANSWERS CHECK
                                ;COMPENSATE FOR FORTRAN INACCURACIES.
005636  174267  173160          STF     AC2,    ANS1    ;SAVE FPU ANSWER
005642  062767  000001  173154  ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
005650  005567  173146          ADC     ANS1
005654  173767  173142          CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005660  170000                  CFCC                    ;COPY FLOATING CONDITION CODES
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005662  001414                          BEQ     END15           ;BRANCH IF OK
005664  162767  000002  173132          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
005672  005667  173124                  SBC     ANS1
005676  173767  173120                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
005702  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
005704  001403                          BEQ     END15           ;BRANCH IF OK
005706  174267  173110                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
005712  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

005714  005067  173122          END15:  CLR     FPS             ;CLR FPU FPS BUFFER
005720  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 16:       EXERCISE SUBD (SUBTRACT DOUBLE PRECISION)
                        ;                       ALL INTERUPTS ON
                        ;                       TRUNCATE MODE
                        ;*****************************************************************

005722  012767  007640  173120          MOV     #007640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
005730  005067  173116                  CLR     $FEC            ;CLR FORTRAN FEC
005734  005067  173114                  CLR     $FPC            ;CLR FORTRAN FPC
005740  005067  173076                  CLR     FPS             ;CLR FPU FPS BUFFER
005744  005067  173074                  CLR     FEC             ;CLR FPU FEC BUFFER
005750  005067  173072                  CLR     FPC             ;CLR FPU FPC BUFFER
005754  004767  002364                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
005760  004467  001264                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
005764  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
005766  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
005770  000000G                         $SBD                    ;ADDRESS OF FORTRAN SUBTRACT
005772  007352                          $TST                    ;DETERMINE THE CONDITION CODES
005774  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

005776  016700  173046                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
006002  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
006006  172467  172770                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
006012  172567  172774                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
006016  172767  173010                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
006022  170127  007640                  LDFPS   #007640         ;TURN INTERUPTS ON
006026  012767  006034  004110          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

006034  172600                  RET16:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
006036  173201                          SUBD    AC1,    AC2     ;SUBTRACT AC1 BY AC2
006040  005767  173004                  TST     $FPS            ;CHECK FOR FORTRAN FPS ERROR FLAG
006044  100412                          BMI     ERR16           ;BRANCH IF ERROR FLAG SET
006046  170267  172770                  STFPS   FPS             ;STORE FLOATING POINT STATUS
006052  026767  172764  172770          CMP     FPS,    $FPS    ;CHECK FPS
006060  001427                          BEQ     TST16           ;BRANCH IF OK
006062  174267  172734                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
006066  104001                          HLT+1                   ;FPS ERROR
006070  000465                          BR      END16           ;SKIP TO END

006072  170000                  ERR16:  CFCC                    ;WAIT FOR FPU TO FINISH
006074  026767  172742  172746          CMP     FPS,    $FPS    ;CHECK THE FLOATING POINT STATUS
006102  001402                          BEQ     .+6             ;BRANCH IF OK
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006104  104377                          HLT+377                 ;FPS ERROR
006106  000456                          BR      END16           ;SKIP TO END

006110  026767  172730  172734          CMP     FEC,$FEC        ;CHECK THE FLOATING EXCEPTION CODES
006116  001402                          BEQ     .+6             ;BRANCH IF OK
006120  104377                          HLT+377                 ;FEC IS WRONG
006122  000450                          BR      END16           ;SKIP TO END

006124  026767  172716  172722          CMP     FPC,$FPC        ;CHECK FLOATING PC
006132  001402                          BEQ     TST16           ;BRANCH IF OK
006134  104377                          HLT+377                 ;WRONG ADDRESS IN FPC
006136  000442                          BR      END16           ;SKIP TO END

006140  173702                  TST16:  CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
006142  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006144  001437                          BEQ     END.C           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
006146  174267  172650                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
006152  062767  000001  172650          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
006160  005567  172642                  ADC     ANS1+4
006164  005567  172634                  ADC     ANS1+2
006170  005567  172626                  ADC     ANS1
006174  173767  172622                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
006200  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006202  001420                          BEQ     END16           ;BRANCH IF OK
006204  162767  000002  172616          SUB     #2,     ANS1+6  ;DECREMENT FPU ANSWER
006212  005667  172610                  SBC     ANS1+4
006216  005667  172602                  SBC     ANS1+2
006222  005667  172574                  SBC     ANS1
006226  173767  172570                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
006232  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006234  001403                          BEQ     END16           ;BRANCH IF OK
006236  174267  172560                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
006242  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

006244  005067  172572          END16:  CLR     FPS             ;CLR FPU FPS BUFFER
006250  104400                          SCOPE

                        ;*****************************************************************
                        ;TEST 17:       EXERCISE SUBF (SUBTRACT FLOATING)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF.
                        ;                       TRUNCATE MODE
                        ;*****************************************************************
```

```
006252  012767  004440  172570          MOV     #004440,$FPS    ;SET IE BITS IN FORTRAN ANSWER
006260  005067  172566                  CLR     $FEC            ;CLR FORTRAN FEC
006264  005067  172564                  CLR     $FPC            ;CLR FORTRAN FPC
006270  005067  172546                  CLR     FPS             ;CLR FPU FPS BUFFER
006274  005067  172544                  CLR     FEC             ;CLR FPU FEC BUFFER
006300  005067  172542                  CLR     FPC             ;CLR FPU FPC BUFFER
006304  004767  001676                  JSR     PC,     RANDM2  ;GET RANDOM INPUT DATA
006310  004467  000734                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
006314  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM
006316  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM
006320  0000006                         $SBR                    ;ADDRESS OF FORTRAN SUBTRACT
006322  007352                          $TST                    ;DETERMINE THE CONDITION CODES
006324  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE

006326  016700  172516                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
006332  170127  040000                  LDFPS   #040000         ;LOAD FPS, INTERUPT DISABLE
006336  172467  172440                  LDF     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
006342  172567  172444                  LDF     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
006346  172767  172460                  LDF     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
006352  170127  004440                  LDFPS   #004440         ;TURN INTERUPTS ON, EXCEPT OVERFLOW AND UNDERFLOW
006356  012767  006364  003560          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

006364  172600                  RET17:  LDF     AC0,    AC2     ;LOAD AC0 INTO AC2
006366  173201                          SUBF    AC1,    AC2     ;SUBTRACT AC1 BY AC2
006370  170267  172446                  STFPS   FPS             ;STORE FLOATING POINT STATUS
006374  026767  172442  172446          CMP     FPS,    $FPS    ;CHECK FPS
006402  001404                          BEQ     TST17           ;BRANCH IF OK
006404  174267  172412                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
006410  104001                          HLT+1                   ;FPS ERROR
006412  000436                          BR      END17           ;SKIP COMPARE

006414  032767  000002  172426  TST17:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
006422  001032                          BNE     END17           ;BRANCH IF OVERFLOW
006424  173702                          CMPF    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
006426  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006430  001427                          BEQ     END17           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
006432  174267  172364                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
006436  062767  000001  172360          ADD     #1,     ANS1+2  ;INCREMENT FPU ANSWER
006444  005567  172352                  ADC     ANS1
006450  173767  172346                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
006454  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006456  001414                          BEQ     END17           ;BRANCH IF OK
006460  162767  000002  172336          SUB     #2,     ANS1+2  ;DECREMENT FPU ANSWER
006466  005667  172330                  SBC     ANS1
006472  173767  172324                  CMPF    ANS1,   AC3     ;CHECK ANSWERS AGAIN
006476  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006500  001403                          BEQ     END.7           ;BRANCH IF OK
006502  174267  172314                  STF     AC2,    ANS1    ;SAVE FPU ANSWER
006506  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

006510  005067  172326          END17:  CLR     FPS             ;CLR FPU FPS BUFFER
006514  104000                          $SCOPE
```

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                        ;*****************************************************************
                        ;TEST 20:       EXERCISE SUBD (SUBTRACT DOUBLE PRECISION)
                        ;                       OVERFLOW AND UNDERFLOW INTERUPTS OFF
                        ;                       TRUNCATE MODE
                        ;*****************************************************************

006516  012767  004640  172324          MOV     #004640,$FPS    ;SET IE BITS IN FORTRAN ANSWER
006524  005067  172322                  CLR     $FEC            ;CLR FORTRAN FEC
006530  005067  172320                  CLR     $FPC            ;CLR FORTRAN FPC
006534  005067  172302                  CLR     FPS             ;CLR FPU FPS BUFFER
006540  005067  172300                  CLR     FEC             ;CLR FPU FEC BUFFER
006544  005067  172276                  CLR     FPC             ;CLR FPU FPC BUFFER
006550  004767  001570                  JSR     PC,     RANDM4  ;GET RANDOM INPUT DATA
006554  004467  000470                  JSR     R4,     $POLSH  ;ENTER POLISH MODE
006560  007252                          $P.4A                   ;PUSH 4 WORDS ON STACK (LONUM)
006562  007274                          $P.4B                   ;PUSH 4 WORDS ON STACK (HINUM)
006564  000000G                         $SBD                    ;ADDRESS OF FORTRAN SUBTRACT
006566  007352                          $TST                    ;DETERMINE THE CONDITION CODES
006570  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE

006572  016700  172252                  MOV     $FPS,   R0      ;DISPLAY FLOATING POINT STATUS
006576  170127  040200                  LDFPS   #040200         ;LOAD FPS, INTERUPT DISABLE AND FD
006602  172467  172174                  LDD     LONUM,  AC0     ;LOAD AC0 WITH A RANDOM NUMBER
006606  172567  172200                  LDD     HINUM,  AC1     ;LOAD AC1 WITH A RANDOM NUMBER
006612  172767  172214                  LDD     ANS2,   AC3     ;LOAD AC3 WITH THE SUM
006616  170127  004640                  LDFPS   #004640         ;TURN INTERUPTS ON, EXCEPT OVER AND UNDERFLOW
006622  012767  006630  003314          MOV     #.+6,   LAD     ;RESET LOOP ADDRESS

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

006630  172600                  RET20:  LDD     AC0,    AC2     ;LOAD AC0 INTO AC2
006632  173201                          SUBD    AC1,    AC2     ;SUBTRACT AC1 BY AC2
006634  170267  172202                  STFPS   FPS             ;STORE FLOATING POINT STATUS
006640  026767  172176  172202          CMP     FPS,    $FPS    ;CHECK FPS
006646  001404                          BEQ     TST20           ;BRANCH IF OK
006650  174267  172146                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
006654  104001                          HLT     +1              ;FPS ERROR
006656  000446                          BR      END20           ;SKIP COMPARE

006660  032767  000002  172162  TST20:  BIT     #2,     $FPS    ;CHECK FOR OVERFLOW
006666  001042                          BNE     END20           ;BRANCH IF OVERFLOW
006670  173702                          CMPD    AC2,    AC3     ;COMPARE FPU ANSWER TO FORTRAN ANSWER
006672  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006674  001437                          BEQ     END20           ;ANSWERS CHECK
                                        ;COMPENSATE FOR FORTRAN INACCURACIES.
006676  174267  172120                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
006702  062767  000001  172120          ADD     #1,     ANS1+6  ;INCREMENT FPU ANSWER
006710  005567  172112                  ADC     ANS1+4
006714  005567  172104                  ADC     ANS1+2
006720  005567  172076                  ADC     ANS1
006724  173767  172072                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
006730  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
006732  001420                          BEQ     END20           ;BRANCH IF OK
006734  162767  000002  172066          SUB     #2,     ANS1+6  ;DECREMENT FPU ANSWER
006742  005667  172060                  SBC     ANS1+4
006746  005667  172052                  SBC     ANS1+2
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036752  005667  172044                  SBC     ANS1
036756  173767  172040                  CMPD    ANS1,   AC3     ;CHECK ANSWERS AGAIN
036762  170000                          CFCC                    ;COPY FLOATING CONDITION CODES
036764  001403                          BEQ     END20           ;BRANCH IF OK
036766  174267  172030                  STD     AC2,    ANS1    ;SAVE FPU ANSWER
036772  104000                          HLT                     ;FPU AND FORTRAN DISAGREE

036774  005067  172042          END2C:  CLR     FPS             ;CLR FPU FPS BUFFER
000000  104400                          SCOPE
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007002  032737  002000  177570  DONE:   BIT     #SW10,@#SWR     ;RING THE BELL?
007010  001005                  BNE     1$              ;NO!
007012  012767  000207  003120          MOV     #BELL,.TYPE     ;TYPE A BELL
007020  000004  012140                  TYPE,   .TYPE
007024  005046                  1$:     CLR     -(6)            ;CLEAR TRACE TRAP
007026  032737  010000  177570          BIT     #SW12,@#SWR     ;RUN WITH TRT?
007034  001010                  BNE     2$
007036  005167  003100                  COM     TRPB
007042  100005                  BPL     2$
007044  052716  000020                  BIS     #20,(6)         ;SET TRACE TRAP
007050  012746  007102                  MOV     #3$,    -(6)    ;JUMP TO START OF TEST
007054  000002                  RTI
007056  012746  007064          2$:     MOV     #4$,    -(6)    ;JUMP TO START OF TEST
007062  000002                  RTI
007064  013700  000042          4$:     MOV     @#42,R0         ;GET MONITOR ADDRESS
007070  001404                  BEQ     3$              ;IF NONE
007072  004710                  JSR     7,(0)           ;GO TO MONITOR
007074  000240                  NOP
007076  000240                  NOP
007100  000240                  NOP
007102  000137  000200          3$:     JMP     @#200           ;JUMP TO START OF TEST
007106  000002          YESRT:  RTI                     ;RETURN TO PROGRAM FROM TRAP

007110  032737  000400  177570  .EMT:   BIT     #SW08,@#SWR     ;KILL LOOP OR LOOP ON SPEC. TEST
007116  001404                  BEQ     1$
007120  123767  177570  171652          CMPB    @#SWR,ICNT      ;ON RIGHT TEST?   #SW7-0#
007126  001437                  BEQ     OVER
007130  113703  177570          1$:     MOVB    @#SWR,R3        ;GET UB BITS
007134  170003                  LDUB
007136  032737  040000  177570          BIT     #SW14,@#SWR     ;LOOP ON TEST
007144  001026                  BNE     KIT
007146  032737  004000  177570          BIT     #SW11,@#SWR     ;KILL ITERATIONS
007154  001012                  BNE     SAVLAD
007156  105767  171617                  TSTB    ICNT+1
007162  001404                  BEQ     2$              ;BRANCH IF FIRST
007164  126767  002762  171607          CMPB    TIMES,ICNT+1    ;DONE?
007172  001013                  BNE     KIT             ;BRANCH IF NOT
007174  112767  000001  171577  2$:     MOVB    #1,ICNT+1       ;FIRST ITERATION
007202  105267  171572          SAVLAD: INCB    ICNT            ;COUNT TEST NUMBERS
007206  011667  002732                  MOV     (6),LAD         ;SAVE LOOP ADDRESS
007212  016737  171562  177570          MOV     ICNT,@#DISPLAY  ;DISPLAY TEST NO. AND ITERATION COUNT
007220  000002                  RTI                     ;RETURN

007222  105267  171553          KIT:    INCB    ICNT+1
007226  016737  171546  177570  OVER:   MOV     ICNT,@#DISPLAY  ;SET UP DISPLAY
007234  005767  002704                  TST     LAD             ;FIRST ONE?
007240  001760                  BEQ     SAVLAD
007242  016716  002676                  MOV     LAD,(6)         ;FUDGE RETURN ADDRESS
007246  000002                  RTI                     ;FIXES PS
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007250  000134                  $POLSH: JMP     @(R4)+

007252  016746  171532          $P.4A:  MOV     LONUM+6,-(SP)
007256  016746  171524                  MOV     LONUM+4,-(SP)
007262  016746  171516          $P.2A:  MOV     LONUM+2,-(SP)
007266  016746  171510                  MOV     LONUM,  -(SP)
007272  000134                          JMP     @(R4)+

007274  016746  171520          $P.4B:  MOV     HINUM+6,-(SP)
007300  016746  171512                  MOV     HINUM+4,-(SP)
007304  016746  171504          $P.2B:  MOV     HINUM+2,-(SP)
007310  016746  171476                  MOV     HINUM,  -(SP)
007314  000134                          JMP     @(R4)+

007316  012667  171510          $POP2X: MOV     (SP)+,  ANS2
007322  012667  171506                  MOV     (SP)+,  ANS2+2
007326  000204                          RTS     R4              ;EXIT POLISH MODE

007330  012667  171476          $POP4X: MOV     (SP)+,  ANS2
007334  012667  171474                  MOV     (SP)+,  ANS2+2
007340  012667  171472                  MOV     (SP)+,  ANS2+4
007344  012667  171470                  MOV     (SP)+,  ANS2+6
007350  000204                          RTS     R4              ;EXIT POLISH MODE

007352  032767  100002  171470  $TST:   BIT     #100002,$FPS    ;CHECK FOR ERROR FLAG AND OVERFLOW
007360  100437                          BMI     $TER            ;BRANCH IF FLAG SET
007362  001045                          BNE     $TOV            ;BRANCH IF OVERFLOW
007364  032716  077600                  BIT     #077600,(6)     ;TEST THE EXPONENT
007370  001025                          BNE     $TST1           ;BRANCH IF NOT ZERO
007372  052767  000004  171450          BIS     #04,    $FPS    ;SET Z BIT
007400  032767  077600  171374          BIT     #077600,LONUM   ;CHECK OPERAND FOR ZERO EXPONENT
007406  001404                          BEQ     $TST3           ;BRANCH IF ZERO
007410  032767  030000  171432          BIT     #030000,$FPS    ;CHECK FOR INTERUPTS ENABLED
007416  001412                          BEQ     $TST1           ;BRANCH IF NOT SET
007420  005016                  $TST3:  CLR     (6)             ;CLEAR THE ANSWER
007422  005066  000002                  CLR     2(6)
007426  105767  171416                  TSTB    $FPS            ;CHECK FOR DOUBLE PRECISION
007432  100004                          BPL     $TST1           ;BRANCH IF NOT
007434  005066  000004                  CLR     4(6)
007440  005066  000006                  CLR     6(6)
007444  005716                  $TST1:  TST     (6)             ;FIND THE SIGN
007446  100003                          BPL     $TST2           ;BRANCH IF PLUS
007450  052767  000010  171372          BIS     #10,    $FPS    ;SET N BIT
007456  000134                  $TST2:  JMP     @(R4)+

007460  116701  171314          $TER:   MOVB    ICNT,   R1      ;GET TEST NUMBER
007464  005301                          DEC     R1              ;SET POINTER
007466  006301                          ASL     R1              ;TEST # * 2
007470  016167  007514  171356          MOV     RETAD(1),$FPC   ;STORE FORTRAN FPC
007476  022626                  $TOV:   CMP     (SP)+,  (SP)+   ;"POP" 2 WORDS
007500  105767  171344                  TSTB    $FPS            ;CHECK FD BIT
007504  100001                          BPL     $TOV1           ;BRANCH IF FLOATING MODE
007506  022626                          CMP     (SP)+,  (SP)+   ;"POP" 2 MORE WORDS
007510  005724                  $TOV1:  TST     (R4)+           ;SKIP "POPX" ROUTINE
007512  000204                          RTS     R4              ;EXIT POLISH MODE
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007514  001400                      RETAD:  RET1
007516  001666                              RET2
007520  000000                              DUMMY
007522  000000                              DUMMY
007524  002640                              RET5
007526  003150                              RET6
007530  000000                              DUMMY
007532  000000                              DUMMY
007534  004266                              RET11
007536  004554                              RET12
007540  000000                              DUMMY
007542  000000                              DUMMY
007544  005526                              RET15
007546  006036                              RET16
007550  000000                              DUMMY
007552  000000                              DUMMY
007554  026527  000002  001005  $ERR:       CMP     2(5),   #1005   ;CHECK FOR UNDERFLOW, FD=0
007562  001415                              BEQ     $UNDR0          ;BRANCH IF UNDERFLOW
007564  026527  000002  000405              CMP     2(5),   #0405   ;CHECK FOR UNDERFLOW, FD=1
007572  001427                              BEQ     $UNDR1          ;BRANCH IF UNDERFLOW
007574  026527  000002  001003              CMP     2(5),   #1003   ;CHECK FOR OVERFLOW, FD=0
007602  001474                              BEQ     $OVER0          ;BRANCH IF OVERFLOW
007604  026527  000002  000403              CMP     2(5),   #0403   ;CHECK FOR OVERFLOW, FD=1
007612  001502                              BEQ     $OVER1          ;BRANCH IF OVERFLOW
007614  000000                  $UNKER:     HALT                    ;UNKNOWN ERROR!

007616  032767  003000  171224  $UNDP0:     BIT     #003000,$FPS    ;CHECK FOR INTERUPTS ON OR OFF
007624  001523                              BEQ     $ERTS           ;BRANCH IF OFF
007626  004467  177416                      JSR     R4,     $POLSH  ;ENTER POLISH MODE
007632  007262                              $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
007634  007304                              $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
007636  007722                              $200A0                  ;ADD 200 TO THE EXPONENTS
007640  010142                  .ERR1:      .ERR                    ;ADDRESS OF FORTRAN ADD OR SUBTRACT
                                                                    ;THIS ADDRESS IS MODIFIED BY THE PROGRAM
007642  007752                              $200SB                  ;SUBTRACT 200 FROM THE EXPONENT OF ANS
007644  007352                              $TST                    ;DETERMINE CONDITION CODES
007646  007316                              $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE
007650  000415                              BR      $UNDRA

007652  032767  003000  171170  $UNDR1:     BIT     #003000,$FPS    ;CHECK FOR INTERUPTS ON OR OFF
007660  001505                              BEQ     $ERTS           ;BRANCH IF OFF
007662  004467  177362                      JSR     R4,     $POLSH  ;ENTER POLISH MODE
007666  007252                              $P.4A                   ;PUSH 2 WORDS ON STACK (LONUM)
007670  007274                              $P.4B                   ;PUSH 2 WORDS ON STACK (HINUM)
007672  007736                              $200A1                  ;ADD 200 TO THE EXPONENTS
007674  010142                  .ERR2:      .ERR                    ;ADDRESS OF FORTRAN ADD OR SUBTRACT
                                                                    ;THIS ADDRESS IS MODIFIED BY THE PROGRAM
007676  007752                              $200SB                  ;SUBTRACT 200 FROM THE EXPONENT OF ANS
007700  007352                              $TST                    ;DETERMINE CONDITION CODES
007702  007330                              $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE
007704  052767  100000  171136  $UNDRA:     BIS     #100000,$FPS    ;SET FPS ERROR FLAG
007712  012767  000012  171132              MOV     #12.,   $FEC    ;SET UNDERFLOW EXCEPTION CODE
007720  000205                              RTS     %5              ;RETURN TO FORTRAN ROUTINE

007722  062716  040000          $200A0:     ADD     #040000,(SP)
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007726  062766  040000  000004          ADD     #040000,4(SP)
007734  000134                          JMP     @(R4)+

007736  062716  040000          $200A1: ADD     #040000,(SP)
007742  062766  040000  000010          ADD     #040000,10(SP)
007750  000134                          JMP     @(R4)+

007752  162716  040000          $200SB: SUB     #040000,(SP)
007756  032767  000003  170012          BIT     #3,     PS      ;TEST FOR  C OR V BITS
007764  001402                          BEQ     $201SB
007766  062716  100000                  ADD     #100000,(SP)
007772  000134                  $201SB: JMP     @(R4)+

007774  004467  177250          $OVERC: JSR     R4,     $POLSH  ;ENTER POLISH MODE
010000  007262                          $P.2A                   ;PUSH 2 WORDS ON STACK (LONUM)
010002  007304                          $P.2B                   ;PUSH 2 WORDS ON STACK (HINUM)
010004  010104                          $200S0                  ;SUBTRACT 200 FROM THE EXPONENTS
010006  010142                  .ERR3:  .ERR                    ;ADDRESS OF FORTRAN ADD OR SUBTRACT
                                                                ;THIS ADDRESS IS MODIFIED BY THE PROGRAM
010010  010134                          $200AD                  ;ADD 200 TO THE EXPONENT OF ANS
010012  007352                          $TST                    ;DETERMINE CONDITION CODES
010014  007316                          $POP2X                  ;POP 2 WORDS AND EXIT POLISH MODE
010016  000411                          BR      $OVERA

010020  004467  177224          $OVER1: JSR     R4,     $POLSH  ;ENTER POLISH MODE
010024  007252                          $P.4A                   ;PUSH 2 WORDS ON STACK (LONUM)
010026  007274                          $P.4B                   ;PUSH 2 WORDS ON STACK (HINUM)
010030  010120                          $200S1                  ;SUBTRACT 200 FROM THE EXPONENTS
010032  010142                  .ERR4:  .ERR                    ;ADDRESS OF FORTRAN ADD OR SUBTRACT
                                                                ;THIS ADDRESS IS MODIFIED BY THE PROGRAM
010034  010134                          $200AD                  ;ADD 200 TO THE EXPONENT OF ANS
010036  007352                          $TST                    ;DETERMINE CONDITION CODES
010040  007330                          $POP4X                  ;POP 4 WORDS AND EXIT POLISH MODE
010042  032767  003000  171000  $OVERA: BIT     #003000,$FPS    ;CHECK FOR INTERUPTS ON OR OFF
010050  001406                          BEQ     $OVR1           ;BRANCH IF OFF
010052  052767  100000  170770          BIS     #100000,$FPS    ;SET FPS ERROR FLAG
010060  012767  000010  170764          MOV     #10,    $FEC    ;SET OVERFLOW EXCEPTION CODE
010066  052767  000002  170754  $OVR1:  BIS     #02,    $FPS    ;SET OVERFLOW BIT IN FPS
010074  052767  000004  170746  $ERTS:  BIS     #04,    $FPS    ;SET THE Z BIT IN FPS
010102  000205                          RTS     %5

010104  162716  040000          $200S0: SUB     #040000,(SP)
010110  162766  040000  000004          SUB     #040000,4(SP)
010116  000134                          JMP     @(R4)+

010120  162716  040000          $200S1: SUB     #040000,(SP)
010124  162766  040000  000010          SUB     #040000,10(SP)
010132  000134                          JMP     @(R4)+

010134  062716  140000          $200AD: ADD     #140000,(SP)
010140  000134                          JMP     @(R4)+

010142  000000                  .ERR:   HALT                    ;PROGRAM DID NOT START AT 200
010144  000137  000200                  JMP     @#200

                                ;*****************************************************************************
```

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

010150  170267  170666          FLTERR: STFPS   FPS              ;STORE FLOATING POINT STATUS
010154  170367  170664                  STST    FEC              ;STORE FLOATING EXCEPTION CODES
010160  032767  040000  170662          BIT     #40000, $FPS     ;CHECK INTERUPT DISABLE
010166  001402                          BEQ     .+6              ;BRANCH IF OFF
010170  104377                          HLT+377                  ;INTERUPT NOT SUPPOSED TO BE ENABLED
010172  000404                          BR      ERRTI

010174  005767  170650                  TST     $FPS             ;CHECK FORTRAN FPS FOR ERROR FLAG
010200  100401                          BMI     ERRTI            ;BRANCH IF FLAG SET
010202  104377                          HLT+377                  ;FLOATING POINT STATUS ERROR

010204  000002                  ERRTI:  RTI
```

```
010206  010046                  RANDM2: MOV     %0,-(6)         ;SAVE R0
010210  010146                          MOV     %1,-(6)         ;SAVE R1
010212  010246                          MOV     %2,-(6)         ;SAVE R2
010214  010346                          MOV     %3,-(6)         ;SAVE R3
010216  010446                          MOV     %4,-(6)         ;SAVE R4
010220  010546                          MOV     %5,-(6)         ;SAVE R5
010222  012704  001002                  MOV     #LONUM,%4       ;SET UP LONUM POINTER
010226  012705  001012                  MOV     #HINUM,%5       ;SET UP HINUM POINTER
010232  011400                          MOV     (4),%0          ;SET R0 WITH LOW
010234  011501                          MOV     (5),%1          ;SET R1 WITH HIGH
010236  012703  177771          REPET2: MOV     #-7,%3          ;SET SHIFT COUNT
010242  005002                          CLR     %2
010244  006300                  SHIFT2: ASL     %0              ;SHIFT R0 LEFT AND
010246  006101                          ROL     %1              ;ROTATE CARRY INTO R1 AND
010250  006102                          ROL     %2              ;ROTATE CARRY INTO R2
010252  005203                          INC     %3              ;CHECK FOR DONE
010254  001373                          BNE     SHIFT2          ;CONTINUE SHIFT LOOP
010256  061402                          ADD     (4),%2          ;ADD NUMBER TO MAKE X 129
010260  005501                          ADC     %1              ;PROPOGATE CARRY
010262  061501                          ADD     (5),%1          ;ADD NUMBER TO MAKE X 129
010264  005502                          ADC     %2              ;PROPOGATE CARRY
010266  062700  001057                  ADD     #1057,%0        ;ADD LOW CONSTANT
010272  005501                          ADC     %1              ;PROPOGATE CARRY
010274  005502                          ADC     %2              ;PROPOGATE CARRY
010276  062701  047401                  ADD     #47401,%1       ;ADD HIGH CONSTANT
010302  005502                          ADC     %2              ;PROPOGATE CARRY
010304  062702  000006                  ADD     #6,%2           ;ADD HIGHEST CONSTART
010310  060200                          ADD     %2,%0           ;REPRIME R0 WITH HIGHEST DIGIT
010312  005501                          ADC     %1              ;PROPOGATE CARRY
010314  010024                          MOV     %0,(4)+         ;SAVE R0
010316  010125                          MOV     %1,(5)+         ;SAVE R1
010320  020427  001006                  CMP     %4,#LONUM+4     ;CHECK FOR DONE ENOUGH
010324  001344                          BNE     REPET2          ;BRANCH IF NOT DONE
010326  012605                          MOV     (6)+,%5         ;RESTORE R5
010330  012604                          MOV     (6)+,%4         ;RESTORE R4
010332  012603                          MOV     (6)+,%3         ;RESTORE R3
010334  012602                          MOV     (6)+,%2         ;RESTORE R2
010336  012601                          MOV     (6)+,%1         ;RESTORE R1
010340  012600                          MOV     (6)+,%0         ;RESTORE R0
010342  000207                          RTS     %7              ;RETURN
```

```
010344  010046                  RANDM4: MOV     %0,-(6)         ;SAVE R0
010346  010146                          MOV     %1,-(6)         ;SAVE R1
010350  010246                          MOV     %2,-(6)         ;SAVE R2
010352  010346                          MOV     %3,-(6)         ;SAVE R3
010354  010446                          MOV     %4,-(6)         ;SAVE R4
010356  010546                          MOV     %5,-(6)         ;SAVE R5
010360  012704  001002                  MOV     #LONUM,%4       ;SET UP LONUM POINTER
010364  012705  001012                  MOV     #HINUM,%5       ;SET UP HINUM POINTER
010370  011400                          MOV     (4),%0          ;SET R0 WITH LOW
010372  011501                          MOV     (5),%1          ;SET R1 WITH HIGH
010374  012703  177771          REPET4: MOV     #-7,%3          ;SET SHIFT COUNT
010400  005002                          CLR     %2
010402  006300                  SHIFT4: ASL     %0              ;SHIFT R0 LEFT AND
010404  006101                          ROL     %1              ;ROTATE CARRY INTO R1 AND
010406  006102                          ROL     %2              ;ROTATE CARRY INTO R2
010410  005203                          INC     %3              ;CHECK FOR DONE
010412  001373                          BNE     SHIFT4          ;CONTINUE SHIFT LOOP
010414  061402                          ADD     (4),%2          ;ADD NUMBER TO MAKE X 129
010416  005501                          ADC     %1              ;PROPOGATE CARRY
010420  061501                          ADD     (5),%1          ;ADD NUMBER TO MAKE X 129
010422  005502                          ADC     %2              ;PROPOGATE CARRY
010424  062700  001057                  ADD     #1057,%0        ;ADD LOW CONSTANT
010430  005501                          ADC     %1              ;PROPOGATE CARRY
010432  005502                          ADC     %2              ;PROPOGATE CARRY
010434  062701  047401                  ADD     #47401,%1       ;ADD HIGH CONSTANT
010440  005502                          ADC     %2              ;PROPOGATE CARRY
010442  062702  000006                  ADD     #6,%2           ;ADD HIGHEST CONSTART
010446  060200                          ADD     %2,%0           ;REPRIME R0 WITH HIGHEST DIGIT
010450  005501                          ADC     %1              ;PROPOGATE CARRY
010452  010024                          MOV     %0,(4)+         ;SAVE R0
010454  010125                          MOV     %1,(5)+         ;SAVE R1
010456  020427  001012                  CMP     %4,#LONUM+10    ;CHECK FOR DONE ENOUGH
010462  001344                          BNE     REPET4          ;BRANCH IF NOT DONE
010464  012605                          MOV     (6)+,%5         ;RESTORE R5
010466  012604                          MOV     (6)+,%4         ;RESTORE R4
010470  012603                          MOV     (6)+,%3         ;RESTORE R3
010472  012602                          MOV     (6)+,%2         ;RESTORE R2
010474  012601                          MOV     (6)+,%1         ;RESTORE R1
010476  012600                          MOV     (6)+,%0         ;RESTORE R0
010500  000207                          RTS     %7              ;RETURN
```

```
010502  032767  002000  167060  .TRP:   BIT     #2000,SWR
010510  001405                          BEQ     .ET
010512  012767  000207  001420          MOV     #BEL,..TYPE     ;TYPE A BELL
010520  000004  012140                  TYPE,   .TYPE
010524  005267  001416          .ET:    INC     ERRORS          ;COUNT THE NUMBER OF ERRORS
010530  032767  020000  167032          BIT     #20000,SWR      ;SKIP TYPEOUT IF SET
010536  001116                          BNE     NHEAD
010540  174267  170256                  STF     AC2,    ANS1    ;SAVE THE ANSWER, TO BE SURE
010544  000004  012042                  TYPE,   RET
010550  000004  012042                  TYPE,   RET
010554  011646                          MOV     (6),-(6)        ;PUT ADDRESS OF INSTRUCTION ON STAC
010556  162716  000002                  SUB     #2,(6)
010562  117667  000000  001360          MOVB    @(6),   WORDS
010570  012605                          MOV     (6)+,TTY        ;TYPE (6)+ IN OCTAL
010572  004767  000546                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010576  000004  012037                  TYPE,   SPACE+3
010602  012703  001002                  MOV     #LONUM, %3      ;SET UP POINTER
010606  004767  000174                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
010612  000004  012045                  TYPE,   $SIGN
010616  004767  000164                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
010622  000004  012072                  TYPE,   FPUAN
010626  004767  000154                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
010632  000004  012036                  TYPE,   SPACE+2
010636  016705  170200                  MOV     FPS,TTY         ;TYPE FPS IN OCTAL
010642  004767  000476                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010646  105767  001276                  TSTB    WORDS           ;CHECK FOR STATUS ERROR
010652  100014                          BPL     .STAT           ;BRANCH IF NOT
010654  000004  012036                  TYPE,   SPACE+2
010660  016705  170160                  MOV     FEC,TTY         ;TYPE FEC IN OCTAL
010664  004767  000454                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010670  000004  012036                  TYPE,   SPACE+2
010674  016705  170146                  MOV     FPC,TTY         ;TYPE FPC IN OCTAL
010700  004767  000440                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010704  000004  012053          .STAT:  TYPE,   FORTAN
010710  004767  000072                  JSR     7,      $TYPE   ;TYPE A FLOATING POINT NUMBER
010714  105767  001230          NOHEAD: TSTB    WORDS
010720  001425                          BEQ     NHEAD
010722  000004  012036                  TYPE,   SPACE+2
010726  016705  170116                  MOV     $FPS,TTY        ;TYPE $FPS IN OCTAL
010732  004767  000406                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010736  105767  001206                  TSTB    WORDS
010742  100014                          BPL     NHEAD
010744  000004  012036                  TYPE,   SPACE+2
010750  016705  170076                  MOV     $FEC,TTY        ;TYPE $FEC IN OCTAL
010754  004767  000364                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010760  000004  012036                  TYPE,   SPACE+2
010764  016705  170064                  MOV     $FPC,TTY        ;TYPE $FPC IN OCTAL
010770  004767  000350                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
010774  005737  177570          NHEAD:  TST     @#SWR
011000  100001                          BPL     .+4
011002  000000                          HALT
011004  000002                          PTI
```

```
011006  032767  001000  166554  $TYPE:  BIT     #1000,  SWR     ;CHECK TTY FORMAT
011014  001007                          BNE     TYPEI
011016  105767  170026                  TSTB    @#FPS
011022  100432                          BMI     TYPED
011024  004767  000076                  JSR     7,      TYPEF
011030  022323                  TYPEA:  CMP     (3)+,   (3)+    ;UP DATE THE TYPEOUT POINTER
011032  000207                          RTS     7

011034                          TYPEI:
011034  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
011036  004767  000302                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
011042  000004  012040                  TYPE,   SPACE+4
011046  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
011050  004767  000270                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
011054  105767  167770                  TSTB    @#FPS
011060  100363                          BPL     TYPEA
011062  000004  012040                  TYPE,   SPACE+4
011066  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
011070  004767  000250                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
011074  000004  012040                  TYPE,   SPACE+4
011100  012305                          MOV     (3)+,TTY        ;TYPE (3)+ IN OCTAL
011102  004767  000236                  JSR     %7,PRINTR       ;TYPE LEADING ZERO'S
011106  000207                          RTS     7

011110  012346                  TYPED:  MOV     (3)+,-(6)       ;GET WORD 1
011112  012346                          MOV     (3)+,-(6)       ;GET WORD 2
011114  012346                          MOV     (3)+,-(6)       ;GET WORD 3
011116  012346                          MOV     (3)+,-(6)       ;GET WORD 4
011120  012746  000022                  MOV     #18.,-(6)       ;CHAR COUNT
011124  000406                          BR      TYPE1

011126  012346                  TYPEF:  MOV     (3)+,-(6)       ;GET WORD 1
011130  012346                          MOV     (3)+,-(6)       ;GET WORD 2
011132  005046                          CLR     -(6)            ;CLEAR WORD 3
011134  005046                          CLR     -(6)
011136  012746  000010                  MOV     #8.,-(6)        ;CHAR COUNT
011142  004767  000104          TYPE1:  JSR     7,TY1           ;TYPE 1 BIT
011146  105766  000011                  TSTB    9.(6)           ;CHECK EXPONENT
011152  001001                          BNE     .+4             ;BRANCH ON NON-ZERO EXPONENT
011154  005116                          COM     (6)             ;FLAG ZERO EXPONENT
011156  000004  012040                  TYPE,   SPACE+4
011162  004767  000072                  JSR     7,TY2           ;TYPE 2 BITS
011166  004767  000074                  JSR     7,TY3           ;TYPE 3 BITS
011172  004767  000070                  JSR     7,TY3           ;TYPE 3 BITS
011176  000004  012040                  TYPE,   SPACE+4
011202  004767  000020                  JSR     7,TY2           ;TYPE 2 BITS
011206  004767  000054          TYPE2:  JSR     7,TY3           ;TYPE 3 BITS
011212  005316                          DEC     (6)             ;DONE?
011214  001374                          BNE     TYPE2
011216  022626                          CMP     (6)+,6,+        ;RESTORE
011220  022626                          CMP     (6)+,6,+        ;  THE
011222  005726                          TST     6,+             ; STACK
011224  000207                          RTS     7
```

```
011226  005766  000002          TYH:    TST     2(6)            ;CHECK FOR ZERO EXPONENT FLAG
011232  100405                          BMI     TYZ             ;BRANCH ON ZERO EXPONENT
011234  012746  000001                  MOV     #1,-(6)         ;TYPE HIDDEN BIT AND ONE
011240  011667  000674                  MOV     (6),.TYPE       ;FUDGE HIDDEN BIT
011244  000414                          BR      TY+4
011246  005166  000002          TYZ:    COM     2(6)            ;GET RID OF ZERO EXPONENT FLAG
011252  012746  000001          TY1:    MOV     #1,-(6)         ;TYPE 1 BIT
011256  000405                          BR      TY
011260  012746  000002          TY2:    MOV     #2,-(6)         ;TYPE 2 BITS
011264  000402                          BR      TY
011266  012746  000003          TY3:    MOV     #3,-(6)         ;TYPE 3 BITS
011272  005067  000642          TY:     CLR     .TYPE
011276  006166  000006                  ROL     6(6)            ;SHIFT WORD 4
011302  006166  000010                  ROL     8.(6)           ;SHIFT WORD 3
011306  006166  000012                  ROL     10.(6)          ;SHIFT WORD 2
011312  006166  000014                  ROL     12.(6)          ;SHIFT WORD 1
011316  006167  000616                  ROL     .TYPE           ;GET IT
011322  005316                          DEC     (6)             ;DONE?
011324  001364                          BNE     TY+4
011326  052767  000060  000BC+          BIS     #'0,.TYPE       ;MAKE IT ASCII
011334  000004  012140                  TYPE.   .TYPE           ;TYPE IT
011340  005726                          TST     (6)+            ;RESTORE THE STACK
011342  000207                          RTS     PC
```

```
011344  112767  000001  000130  PRINTR: MOVB    #1,.PR          ;SET ZERO FILL SWITCH
011352  000402                  BR      .+6
011354  005067  000122          PRINTS: CLR     .PR             ;SUPRESS LEADING ZERO'S
011360  112767  177772  000115          MOVB    #-6,.PR+1       ;SET COUNT
011366  010446                          MOV     R4,-(6          ;SAVE R4
011370  012704  011472                  MOV     #3$,R4          ;SET POINTER TO FIRST ASCII CHAR.
011374  105014                          CLRB    (4)             ;CLEAR FIRST BYTE
011376  000405                          BR      2$              ;ROTATE FIRST BIT
011400  105014                  1$:     CLRB    (4)             ;CLEAR BYTE OF CHARACTER
011402  006105                          ROL     TTY             ;ROTATE BIT INTO C
011404  106114                          ROLB    (4)             ;PACK IT
011406  006105                          ROL     TTY             ;ROTATE BIT INTO C
011410  106114                          ROLB    (4)             ;PACK IT
011412  006105                  2$:     ROL     TTY             ;ROTATE BIT INTO C
011414  106114                          ROLB    (4)             ;PACK IT
011416  105714                          TSTB    (4)
011420  001402                          BEQ     .+6
011422  105267  000054                  INCB    .PR
011426  105767  000050                  TSTB    .PR             ;CHECK FILL SWITCH
011432  001402                          BEQ     .+6
011434  152724  000060                  BISB    #'0,(4)+        ;MAKE INTO ASCII CHAR
011440  105267  000037                  INCB    .PR+1
011444  001355                          BNE     1$              ;REPEAT
011446  022704  011472                  CMP     #3$,R4
011452  001002                          BNE     .+6
011454  112724  000060                  MOVB    #'0,(4)+
011460  105014                          CLRB    (4)
011462  000004  011472                  TYPE    ,3$             ;TYPE IT
011466  012604                          MOV     (6)+,R4         ;RESTORE R4
011470  000207                          RTS     PC

011472  000004                  3$:     .BLKW   4
011502  000000                  .PR:    0

011504  005267  000436          ERROR:  INC     ERRORS          ;COUNT ERRORS
011510  132737  000001  000041          BITB    #1,@#41         ;AUTO MODE?
011516  001412                          BEQ     1$              ;NO!
011520  022767  000010  000420          CMP     #10.,ERRORS     ;TOO MANY?
011526  001006                          BNE     1$              ;NOT YET
011530  013700  000042                  MOV     @#42,R0         ;GET ADDRESS
011534  001403                          BEQ     1$              ;FORGET IT IF ZERO
011536  005037  000042                  CLR     @#42            ;ZAP 42
011542  004710                          JSR     PC,(0)          ;CALL THE MONITOR
011544  000207                  1$:     RTS     PC              ;RETURN
```

```
011546  012777  011742  000360  POWDWN: MOV     #ILLUP,@UPVEC   ;SET FOR FAST UP
011554  012777  000340  000354          MOV     #340,@UPVEC+2   ;PRIO:7
011562  170246                          STFPS   -(6)            ;GET THE FPS
011564  170011                          SETD
011566  174046                          STD     AC0,-(6)        ;SAVE AC'S
011570  174146                          STD     AC1,-(6)
011572  174246                          STD     AC2,-(6)
011574  174346                          STD     AC3,-(6)
011576  172404                          LDD     AC4,AC0
011600  174046                          STD     AC0,-(6)
011602  172405                          LDD     AC5,AC0
011604  174046                          STD     AC0,-(6)
011606  010046                          MOV     R0,-(6)         ;SAVE REGISTERS
011610  010146                          MOV     R1,-(6)
011612  010246                          MOV     R2,-(6)
011614  010346                          MOV     R3,-(6)
011616  010446                          MOV     R4,-(6)
011620  010546                          MOV     R5,-(6)
011622  010667  000266                  MOV     SP,SAVE6        ;SAVE SP
011626  012777  011636  000300          MOV     #POWUP,@UPVEC   ;SET UP VECTOR
011634  000000                          HALT

011636  016706  000252          POWUP:  MOV     SAVE6,SP        ;GET SP
011642  005001                          CLR     R1              ;WAIT LOOP FOR THE TTY
011644  005201                  1$:     INC     R1
011646  001376                          BNE     1$
011650  012605                          MOV     (6)+,R5         ;GET THE REGISTERS
011652  012604                          MOV     (6)+,R4
011654  012603                          MOV     (6)+,R3
011656  012602                          MOV     (6)+,R2
011660  012601                          MOV     (6)+,R1
011662  012600                          MOV     (6)+,R0
011664  170011                          SETD
011666  172426                          LDD     (6)+,AC0        ;RESTORE THE AC'S
011670  174005                          STD     AC0,AC5
011672  172426                          LDD     (6)+,AC0
011674  174004                          STD     AC0,AC4
011676  172726                          LDD     (6)+,AC3
011700  172626                          LDD     (6)+,AC2
011702  172526                          LDD     (6)+,AC1
011704  172426                          LDD     (6)+,AC0
011706  170126                          LDFPS   (6)+            ;RESTORE FPS
011710  012777  011546  000212          MOV     #POWDWN,@DWNVEC ;SET UP THE POWER DOWN VECTOR
011716  012777  000340  000206          MOV     #340,@DWNVEC+2
011724  000004  011730                  TYPE,   .+2             ;.ASCIZ <15><12>"POWER"
011740  000002                          RTI

011742  000000          ILLUP:  HALT                            ;THE POWER UP SEQUENCE WAS STARTED
011744  000776                  BR      .-2                     ; BEFORE THE POWER DOWN WAS COMPLETE
```

```
012746  010546                  .IOT:   MOV     TTY,-(6)        ;SAVE TTY
012750  017605  000002                  MOV     @2(6),TTY       ;GET ADDRESS TO BE TYPED
012754  105715              1$:         TSTB    (TTY)           ;TERMINATOR?
012756  001406                          BEQ     2$
012760  112777  000134                  MOVB    (TTY)+,@TPB     ;LOAD AND TYPE THE CHARACTER
012764  105777  000126                  TSTB    @TPS            ;IS THE PRINTER READY
012770  100375                          BPL     .-4
012772  000770                          BR      1$              ;GET THE NEXT CHARACTER
012774  017646  000002          2$:     MOV     @2(6),-(6)      ;GET ADDRESS TO BE TYPED
013000  062766  000002  000004          ADD     #2,4(6)         ;ADD 2 TO THE ADDRESS
013006  022666  000002                  CMP     (6)+,2(6)       ;IS IT .+2?
013012  001006                          BNE     3$              ;NO
013014  062705  000002                  ADD     #2,TTY          ;ADD 2 TO THE ADDRESS
013020  042705  000001                  BIC     #1,TTY          ;BACK UP TO AN EVEN BYTE
013024  010566  000002                  MOV     TTY,2(6)        ;RESTORE ADDRESS
013030  012605              3$:         MOV     (6)+,TTY        ;RESTORE TTY
013032  000002                          RTI                     ;RETURN

013034  005015  020040  000040  SPACE:  .ASCIZ  <15><12>"   "
013042  005015     000          RET:    .ASCIZ  <15><12>
013045     040  020077     000  $SIGN:  .ASCIZ  " ? "
013051     053               $PLUS:  .ASCII  "+"
013052     055               $MINUS: .ASCII  "-"
013053     015  020012  043040  FORTAN: .ASCIZ  <15><12>"  FORTRAN:  "
013060  051117  051124  047101
013066  020072  000040
013072  036440  005015  020040  FPUAN:  .ASCIZ  " ="<15><12>"  FPU:      "
013100  050106  035125  020040
013106  020040  020040     000
                012114          .EVEN
013114  000000          SAVE6:  0
013116  177564          TPS:    177564          ;TELEPRINTER STATUS REGISTER
013120  177566          TPB:    177566          ;TELEPRINTER DATA BUFFER
013122  172160          FPTADR: 172160          ;FLOATING POINT ADDRESS ON THE 11/20
013124  000244  000246  FPVECT: 244,246         ;FLOATING POINT VECTOR ADDRESS
013130  000024  000026  DWNVEC: 24,26           ;POWER DOWN VECTOR ADDRESS
013134  000024  000026  UPVEC:  24,26           ;POWER UP VECTOR ADDRESS
013140  000000          .TYPE:  0
013142  000000          TRPB:   0
013144  000000          LAD:    0               ;LOOP ADDRESS
013146  000000          ERRORS: 0               ;ERROR COUNT
013150  000000          WORDS:  0               ;CONTAINS TYPEOUT INFO
013152  000377          TIMES:  377             ;ITERATION COUNT
                        .END
```

```
ACC     =.000000    371#  483*  491   556*  564   631*  639   688*  696   747*  755   826*  834
                    909*  917   971*  979   1042* 1050  1115* 1123  1190* 1198  1247* 1255  1306*
                    1314  1384* 1392  1466* 1474  1528* 1536  2065  2069* 2070  2071* 2072  2094*
                    2095  2096* 2097  2101*
ACC1    =.000001    372#  484*  492   557*  565   632*  640   689*  697   748*  756   827*  835
                    910*  918   972*  980   1043* 1051  1116* 1124  1191* 1199  1248* 1256  1307*
                    1315  1385* 1393  1467* 1475  1529* 1537  2066  2100*
ACC2    =.000002    373#  491*  492*  498   518   522   528   564*  565*  571   591   595   603
                    639*  640*  644   650   654   660   696*  697*  701   707   711   719   755*
                    756*  762   782   786   797   834*  835*  841   861   865   880   917*  918*
                    922   928   932   943   979*  980*  984   990   994   1009  1050* 1051* 1057
                    1077  1081  1087  1123* 1124* 1130  1150  1154  1162  1198* 1199* 1203  1209
                    1213  1219  1255* 1256* 1260  1266  1270  1278  1314* 1315* 1321  1341  1345
                    1356  1392* 1393* 1399  1419  1423  1438  1474* 1475* 1479  1485  1489  1530
                    1536* 1537* 1541  1547  1551  1566  1893  2067  2099*
ACC3    =.000003    374#  495*  518   525   558*  591   600   633*  650   657   690*  707   716
                    749*  782   789   794   828*  861   870   877   911*  929   935   940   973*
                    990   999   1006  1044* 1077  1084  1117* 1150  1159  1192* 1209  1215  1249*
                    1266  1275  1308* 1341  1348  1353  1386* 1419  1428  1435  1468* 1485  1532
                    1497  1530* 1547  1556  1563  2068  2098*
ACC4    =.000004    375#  2069  2097*
ACC5    =.000005    376#  2071  2095*
ADDR    001022      413#  498*  522*  523*  524*  525   529*  571*  595*  596*  597*  598*  599*
                    600   603*  644*  654*  655*  656*  657   660*  701*  711*  712*  713*  714*
                    715*  716   719*  762*  786*  787*  788*  789   792*  793*  794   797*  841*
                    865*  866*  867*  868*  869*  870   873*  874*  875*  876*  877   880*  923*
                    932*  933*  934*  935   938*  939*  940   943*  984*  994*  995*  996*  997*
                    998*  999   1002* 1003* 1004* 1005* 1006  1009* 1057* 1081* 1082* 1083* 1084
                    1087* 1130* 1154* 1155* 1156* 1157* 1158* 1159  1162* 1203* 1213* 1214* 1215*
                    1216  1219* 1260* 1270* 1271* 1272* 1273* 1274* 1275  1278* 1321* 1345* 1346*
                    1347* 1348  1351* 1352* 1353  1356* 1399* 1423* 1424* 1425* 1426* 1427* 1429
                    1431* 1432* 1433* 1434* 1435  1438* 1479* 1489* 1490* 1491* 1492  1495* 1496*
                    1497  1500* 1541* 1551* 1552* 1553* 1554* 1555* 1556  1559* 1560* 1561* 1562*
                    1563  1566* 1893*
ANS2    001032      418#  485   558   633   690   749   828   911   973   1044  1117  1192  1249
                    1308  1386  1468  1530  1635* 1636* 1639* 1640* 1641* 1642*
BEG     001056      399   430#
BEGIN   001112      434   439#
BELL    = 000207    393#  1573  1888
DISPLA= 177570      387#  1611* 1615*
DONE    001002      1571#
DUMMY   = 000000    388#  403   404   405   406   408   409   410   411   413   414   415   416
                    418   419   420   421   1679  1680  1683  1684  1687  1688  1691  1692
DWNVEC  012130      442*  443*  2103* 2104* 2146#
END     001544      500   506   511   516   520   527   531#
END10   004106      986   989   992   1001  1008  1012#
END11   004432      1059  1065  1070  1075  1079  1086  1090#
END12   004730      1132  1138  1143  1148  1152  1161  1165#
END13   005152      1205  1208  1211  1218  1222#
END14   005404      1262  1265  1268  1277  1281#
END15   005714      1323  1329  1334  1339  1343  1350  1355  1359#
END16   006244      1401  1407  1412  1417  1421  1430  1437  1441#
END17   006510      1481  1484  1487  1494  1499  1503#
END2    002042      573   579   584   589   593   602   606#
END20   006774      1543  1546  1549  1558  1565  1569#
END3    002264      646   649   652   659   663#
```

DCFPSD.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
END4    002516          703    706    709    718    722*
END5    003026          764    770    775    780    784    791    796    800*
END6    003356          843    849    854    859    863    872    879    883*
END7    003622          924    927    930    937    942    946*
ERROR   011504         2050*
ERRORS  012146         1890*  2050*  2053   2151*
ERRTI   010204         1796   1799   1802*
ERR1    001434          494    502*
ERR11   004322         1053   1061*
ERR12   004610         1126   1134*
ERR15   005562         1317   1325*
ERR16   006072         1395   1403*
ERR5    001722          567    575*
ERR5S   002674          758    766*
ERR6    003204          837    845*
FEC     001044          424*   471*   508    544*   581    619*   676*   735*   772    814*   851    897*   959*
                       1030*  1067   1103*  1140   1178*  1235*  1294*  1331   1372*  1409   1454*  1516*  1732*
                       1914
FLTERR  010150          450    1791*
FORTAN  012053         1919    2134*
FPC     001046          425*   472*   513    545*   586    620*   677*   736*   777    815*   956    898*   960*
                       1031*  1072   1104*  1145   1179*  1236*  1295*  1336   1373*  1414   1455*  1517*  1917
FPS     001042          423*   470*   495*   496    503    531*   543*   568*   569    576    606*   618*   641*
                        642    663*   675*   698*   699    722*   734*   759*   760    767    800*   813*   838*
                        839    846    883*   896*   919*   920    946*   958*   981*   982   1012*  1029*  1054*
                       1055   1062   1090*  1102*  1127*  1128   1135   1165*  1177*  1200*  1201   1222*  1234*
                       1257*  1258   1281*  1293*  1318*  1319   1326   1359*  1371*  1396*  1397   1404   1441*
                       1453*  1476*  1477   1503*  1515*  1538*  1539   1569*  1791*  1909
FPTADR  012122          436    2144*
FPUAN   012072         1906    2137*
FPVECT  012124          450*   451*   2145*
HINUM   001012          408*   484    557    632    689    748    827    910    972   1043   1116   1191   1249
                       1307   1385   1467   1529   1629   1630   1631   1632   1811   1852
HLT     = 104000        391*   499    505    510    515    529    572    578    583    588    604    645    661
                        702    720    763    769    774    779    798    842    848    853    858    881    923
                        944    985   1010   1058   1064   1069   1074   1088   1131   1137   1142   1147   1163
                       1204   1220   1261   1279   1322   1328   1333   1338   1357   1400   1406   1411   1416
                       1439   1480   1501   1542   1567   1795   1800
ICNT    001000          402*   452*  1596    1604   1606   1608*  1609*  1611   1614*  1615   1666
INTUP   011742         2061   2108*
KIT     007222         1601   1607   1614*
LAD     012144          453*   487*   560*   635*   692*   751*   830*   913*   975*  1046*  1119*  1194*  1251*
                       1310*  1388*  1470*  1532*  1610*  1616   1618   2150*
LONUM   001002          403*   483    556    631    688    747    826    909    971   1042   1115   1190   1247
                       1306   1384   1466   1528   1623   1624   1625   1626   1651   1810   1835   1851   1876
                       1902
M112C   001104          431    436*
NHEAD   010774         1892   1922   1927   1934*
NOHEAD  010714         1921*
NOP     = 000240        389*
OVER    007226         1597   1615*
PC      =%000007        370*   473*   546*   621*   678*   737*   816*   893*   961*  1032*  1105*  1180*  1237*
                       1296*  1374*  1456*  1518*  2045*  2058*  2059*
POWDWN  011546          442   2061*  2103
POWLP   011636         2080   2083*
PRINTF  011344         1900   1910   1915   1918   1925   1930   1933   1949   1952   1957   1960   2016*
```

```
PRINTS  011354          2018#
PS    = 177776           386#  1740
RANDM2  010206           473    621    737    899   1032   1180   1296   1456   1804#
RANDM4  010344           546    678    816    961   1105   1237   1374   1518   1845#
REPET2  010236          1814#  1836
REPET4  010374          1855#  1877
RE      012042          1894   1895   2130#
RETAD   007514          1669   1677#
RET1    001400           492#  1677
RET10   003744           980#
RET11   004266          1051#  1685
RET12   004554          1124#  1686
RET13   005052          1199#
RET14   005274          1256#
RET15   005526          1315#  1689
RET16   006036          1393#  1690
RET17   006366          1475#
RET2    001666           565#  1678
RET20   006632          1537#
RET3    002164           640#
RET4    002406           697#
RET5    002640           756#  1681
RET6    003150           835#  1682
RET7    003500           918#
R0    =%000000           362#   445#   481#   554#   629#   686#   745#   824#   907#   969#  1040#  1113#  1189#
                        1245#  1304#  1382#  1464#  1526#  1585#  2055#  2073   2092#
R1    =%000001           363#  1666#  1667#  1668#  2074   2084#  2085#  2091#
R2    =%000002           364#  2075   2090#
R3    =%000003           365#  1598#  2076   2089#
R4    =%000004           366#   474#   547#   622#   679#   738#   817#   900#   962#  1033#  1106#  1181#  1239#
                        1297#  1375#  1457#  1519#  1621   1627   1633   1637#  1643#  1664   1674   1675#  1705#
                        1718#  1733   1737   1743   1745#  1756#  1775   1779   1782   2020   2021#  2039   2044#
                        2077   2088#
R5    =%000005           367#  2078   2087#
SAVE6   012114          2079#  2083   2141#
SAV_AD  007202          1603   1609#  1617
SCOPE = 104400           390#   461    532    607    664    723    801    884    947   1013   1091   1166   1223
                        1282   1360   1442   1504   1570
SHIFT2  010244          1816#  1820
SHIFT4  010402          1857#  1861
SP    =%000006           369#   430#   440#  1623#  1624#  1625#  1626#  1629#  1630#  1631#  1632#  1635   1636
                        1639   1640   1641   1642   1670   1673   1731#  1732#  1735#  1736#  1739#  1742#  1773#
                        1774#  1777#  1778#  1781#  2079   2083#
SPACE   012034          1901   1908   1913   1916   1923   1928   1931   1950   1955   1958   1979   1982   2129#
SWR   = 177570           385#   387   1571   1576   1594   1596   1598   1600   1602   1886   1891   1934   1939
SW08  = 000400           377#  1594
SW09  = 001000           378#
SW10  = 002000           379#  1571
SW11  = 004000           380#  1602
SW12  = 010000           381#  1576
SW13  = 020000           382#
SW14  = 040000           383#  1600
SW15  = 100000           384#
TIMES   012152          1606   2153#
TPB     012120          2115#  2143#
TPS     012116          2116   2142#
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```
TRPB    012142          1578* 2149*
TST1    001502           497   514   518*
TST10   003772           983   988*
TST11   004370          1056  1073  1077*
TST12   004656          1129  1146  1150*
TST13   005100          1202  1207*
TST14   005322          1259  1264*
TST15   005630          1320  1337  1341*
TST16   006140          1398  1415  1419*
TST17   006414          1478  1483*
TST2    001770           570   587   591*
TST20   006660          1540  1545*
TST3    002212           643   648*
TST4    002434           700   705*
TST5    002742           761   778   782*
TST6    003252           840   857   861*
TST7    003526           921   926*
TTY    =%000005          368*  1899* 1909* 1914* 1917* 1924* 1929* 1932* 1948* 1951* 1956* 1959* 2025*
                        2027* 2029* 2111  2112* 2113  2115  2123* 2124* 2125  2126*
TY      011272          1996  1999  2001  2003* 2010
TYH     011226          1983  1992*
TYPE   = 000004           392* 1574  1889  1894  1895  1901  1904  1906  1913  1916  1919  1923
                        1928  1931  1950  1955  1958  1978  1982  2012  2043  2105
TYPEA   011030          1944* 1954
TYPED   011110          1942  1963*
TYPEF   011126          1943  1969*
TYPEI   011034          1940  1947*
TYPEL   011142          1968  1974*
TYPE2   011206          1984* 1986
TYZ     011246          1993  1997*
TY1     011252          1974  1998*
TY2     011260          1979  2000*
TY3     011266          1980  1981  1984  2002*
UPVEC   012134          2061* 2062* 2080* 2147*
WORDS   012150          1898* 1911  1921  1926  2152*
YESRT   007106           433*  441  1592*
$ADD   = ******  G       314*  464   466   550   682   820   965
$ADR   = ******  G       314*  463   465   477   625   741   903
$ERR    007554  G       314* 1693*
$ERTS   010074          1704  1717  1770*
$FEC    001052           427*  468*  508   541*  581   616*  673*  732*  772   811*  851   894*  956*
                        1027* 1067  1100* 1140  1175* 1232* 1291* 1331  1369* 1409  1451* 1513* 1728*
                        1768* 1929
$FPC    001054           428*  469*  513   542*  586   617*  674*  733*  777   812*  855   895*  957*
                        1028* 1072  1101* 1145  1176* 1233* 1292* 1336  1370* 1414  1452* 1514* 1669*
                        1932
$FPS    001050           426*  467*  481   493   496   503   540*  554   566   569   576   615*  629
                         642   648   672*  686   699   705   731*  745   757   760   767   810*  824
                         836   839   846   893*  907   920   926   955*  969   982   988  1026* 1040
                        1052  1055  1062  1099* 1113  1125  1128  1135  1174* 1188  1201  1207  1231*
                        1245  1258  1264  1290* 1304  1316  1319  1326  1368* 1382  1394  1 37  1404
                        1450* 1464  1477  1483  1512* 1526  1539  1545  1645  1650* 1653  1657  1663*
                        1671  1703  1716  1727* 1765  1767* 1769* 1770* 1793  1799  1924  1941  1953
$MINUS  012052          1021  2133*
$OVERA  010042          1754  1765*
$OVERC  007774          1698  1745*
```

```
$OVER1  010020          1700    1756*
$OVR1   010066          1766    1769*
$PLUS   012051           462    2132*
$POLSH  007250           474     547     622     679     738     817     900     962    1033    1106    1181    1238    1297
                        1375    1457    1519    1621*   1705    1718    1745    1756
$POP2X  007316           479     627     743     905    1038    1186    1302    1462    1635*   1713    1753
$POP4X  007330           552     684     822     967    1111    1243    1380    1524    1639*   1726    1764
$P.2A   007262           475     623     739     901    1034    1182    1298    1458    1625*   1706    1746
$P.2B   007304           476     624     740     902    1035    1183    1299    1459    1631*   1707    1747
$P.4A   007252           548     680     818     963    1107    1239    1376    1520    1623*   1719    1757
$P.4B   007274           549     681     819     964    1108    1240    1377    1521    1629*   1720    1758
$SBD    = ******   G     314*   1023    1025    1109    1241    1378    1522
$SBR    = ******   G     314*   1022    1024    1036    1184    1300    1460
$SIGN   012045           462*   1021*   1904    2131*
$TER    007460          1646    1666*
$TOV    007476          1647    1670*
$TOV1   007510          1672    1674*
$TST    007352           478     551     626     683     742     821     904     966    1037    1110    1185    1242    1301
                        1379    1461    1523    1645*   1712    1725    1752    1763
$TST1   007444          1649    1654    1658    1661*
$TST2   007456          1662    1664*
$TST3   007420          1652    1655*
$TYPE   011006          1903    1905    1907    1920    1939*
$UNDRA  007704          1714    1727*
$UNDRO  007616          1694    1703*
$UNDR1  007652          1696    1716*
$UNKER  007614          1701*
$200AD  010134          1751    1762    1781*
$200AO  007722          1708    1731*
$200A1  007736          1721    1735*
$200SB  007752          1711    1724    1739*
$200SO  010104          1748    1773*
$200S1  010120          1759    1777*
$201SB  007772          1741    1743*
.       = 012154         395*    396     397*    401*    487     504     509     560     577     582     635     692     751
                         768     773     830     847     852     913     975    1046    1063    1068    1119    1136    1141
                        1194    1251    1310    1327    1332    1388    1405    1410    1470    1532    1794    1935    1976
                        2017    2032    2035    2040    2047*   2105    2109    2117    2140*
.EMT    007110           448    1594*
.ERR    010142          1709    1722    1749    1760    1784*
.ERR1   007640           463*   1022*   1709*
.ERR2   007674           464*   1023*   1722*
.ERR3   010006           465*   1024*   1749*
.ERR4   010032           466*   1025*   1760*
.ET     010524          1887    1890*
.IOT    011746           444    2111*
.PR     011502          2016*   2018*   2019*   2033*   2034    2037*   2048*
.STAT   010704          1912    1919*
.TRP    010502           446    1886*
.TYPE   012140          1573*   1574    1888*   1889    1995*   2003*   2008*   2011*   2012    2148*
```

DJMP	361#	1899	1909	1914	1917	1924	1929	1932	1947	1951	1956	1959
PRINT	361#	2105										
SDUMP	361#											
STATJS	361#											
TYPEM	361#	1573	1886									

ADC	788	867	868	869	934	996	997	998	1347	1425	1426	1427	1491	1553	1554
	1555	1822	1824	1826	1827	1829	1832	1863	1865	1867	1868	1870	1873		
ADD	787	866	933	995	1346	1424	1490	1552	1731	1732	1735	1736	1742	1781	1821
	1823	1825	1828	1830	1831	1862	1864	1866	1869	1871	1872	2120	2123		
ADDD	565	697	835	980											
ADDF	492	640	756	918											
ASL	1668	1816	1857												
BEQ	497	504	509	514	520	527	570	577	582	587	593	602	643	652	659
	700	709	718	761	768	773	778	784	791	796	840	847	852	857	863
	872	879	921	930	937	942	983	992	1001	1008	1056	1063	1068	1073	1079
	1086	1129	1136	1141	1146	1152	1161	1202	1211	1218	1259	1268	1277	1320	1327
	1332	1337	1343	1350	1355	1398	1405	1410	1415	1421	1430	1437	1478	1487	1494
	1499	1540	1549	1558	1565	1586	1595	1597	1605	1617	1652	1654	1694	1696	1698
	1700	1704	1717	1741	1766	1794	1887	1922	2032	2035	2052	2056	2114		
BIC	2124														
BIS	1580	1650	1663	1727	1767	1769	1770	2011							
BISB	2036														
BIT	648	705	926	988	1207	1264	1483	1545	1571	1576	1594	1600	1602	1645	1648
	1651	1653	1703	1716	1740	1765	1793	1886	1891	1939					
BITB	2051														
BMI	494	567	758	837	1053	1126	1317	1395	1646	1799	1942	1993			
BNE	649	706	927	989	1208	1265	1484	1546	1572	1577	1601	1603	1607	1647	1649
	1820	1836	1861	1877	1892	1940	1976	1986	2010	2038	2040	2054	2086	2122	
BPL	1579	1658	1662	1672	1912	1927	1935	1954	2117						
BR	434	500	506	511	516	573	579	584	589	646	703	764	770	775	780
	843	849	854	859	924	986	1059	1065	1070	1075	1132	1138	1143	1148	1205
	1262	1323	1329	1334	1339	1401	1407	1412	1417	1481	1543	1714	1754	1796	1968
	1996	1999	2001	2017	2023	2109	2118								
CFCC	502	519	526	575	592	601	651	658	708	717	766	783	790	795	845
	862	871	878	929	936	941	991	1000	1007	1061	1078	1085	1134	1151	1160
	1210	1217	1267	1276	1325	1342	1349	1354	1403	1420	1429	1436	1486	1493	1498
	1548	1557	1564												
CLR	452	453	468	469	470	471	472	531	541	542	543	544	545	606	616
	617	618	619	620	663	673	674	675	676	677	722	732	733	734	735
	736	800	811	812	813	814	815	883	894	895	896	897	898	946	956
	957	958	959	960	1012	1027	1028	1029	1030	1031	1090	1100	1101	1102	1103
	1104	1165	1175	1176	1177	1178	1179	1222	1232	1233	1234	1235	1236	1281	1291
	1292	1293	1294	1295	1359	1369	1370	1371	1372	1373	1441	1451	1452	1453	1454
	1455	1503	1513	1514	1515	1516	1517	1569	1575	1655	1656	1659	1660	1815	1856
	1971	1972	2003	2018	2057	2084									
CLRB	2022	2024	2042												
CMF	496	503	508	513	569	576	581	586	642	699	760	767	772	777	839
	846	851	856	920	982	1055	1062	1067	1072	1128	1135	1140	1145	1201	1258
	1319	1326	1331	1336	1397	1404	1409	1414	1477	1539	1670	1673	1693	1695	1697
	1699	1835	1876	1944	1987	1988	2039	2053	2121						
CMPB	1596	1606													
CMPD	591	600	707	716	861	870	877	990	999	1006	1150	1159	1266	1275	1419
	1428	1435	1547	1556	1563										
CMPF	518	525	650	657	782	789	794	928	935	940	1077	1084	1209	1216	1341
	1348	1353	1485	1492	1497										
COM	1578	1977	1997												
DEC	1667	1985	2009												
EMT	391														
HALT	388	396	1701	1784	1936	2081	2108								
INC	1819	1860	1890	2050	2085										
INCB	1609	1614	2033	2037											

[illegible]	392														
[illegible]	399	1591	1621	1627	1633	1664	1733	1737	1743	1775	1779	1782	1785		
JSR	[illegible]	474	546	547	621	622	678	679	737	738	816	817	899	900	961
	962	1032	1033	1105	1106	1180	1191	1237	1238	1296	1297	1374	1375	1456	1457
	1518	1519	1587	1705	1718	1745	1756	1900	1903	1905	1907	1910	1915	1918	1920
	1925	1930	1933	1943	1949	1952	1957	1960	1974	1979	1980	1981	1983	1984	2059
LDD	556	557	558	564	688	689	690	696	826	827	828	834	971	972	973
	[illegible]	1115	1116	1117	1123	1247	1248	1249	1255	1384	1385	1386	1392	1528	1529
	[illegible]	1536	2069	2071	2094	2096	2098	2099	2100	2101					
LDF	483	484	485	491	631	632	633	639	747	748	749	755	909	910	911
	[illegible]	1042	1043	1044	1050	1190	1191	1192	1198	1306	1307	1308	1314	1466	1467
	1468	1474													
LDFPS	482	486	555	559	630	634	687	691	746	750	825	829	908	912	970
	974	1041	1045	1114	1118	1189	1193	1246	1250	1305	1309	1383	1387	1465	1469
	1527	1531	2102												
[illegible]	1599														
MOV	430	431	433	436	439	440	441	442	443	444	445	446	447	448	449
	450	451	463	464	465	466	467	481	487	540	554	560	615	629	635
	672	686	692	731	745	751	810	824	830	893	907	913	955	969	975
	1022	1023	1024	1025	1026	1040	1046	1099	1113	1119	1174	1198	1194	1231	1245
	1251	1290	1304	1310	1368	1382	1388	1450	1464	1470	1512	1526	1532	1573	1581
	1583	1585	1610	1611	1615	1618	1623	1624	1625	1626	1629	1630	1631	1632	1635
	1636	1639	1640	1641	1642	1669	1728	1768	1804	1805	1806	1807	1808	1809	1810
	1811	1812	1813	1814	1833	1834	1837	1838	1839	1840	1841	1842	1845	1846	1847
	1848	1849	1850	1851	1852	1853	1854	1855	1874	1875	1878	1879	1880	1881	1882
	1883	1888	1896	1899	1902	1909	1914	1917	1924	1929	1932	1948	1951	1956	1959
	1963	1964	1965	1966	1967	1969	1970	1973	1994	1995	1998	2000	2002	2020	2021
	2044	2055	2061	2062	2073	2074	2075	2076	2077	2078	2079	2080	2083	2087	2088
	2089	2090	2091	2092	2103	2104	2111	2112	2119	2125	2126				
MOVB	462	1021	1598	1608	1666	1898	2016	2019	2041	2115					
NOP	1588	1589	1590												
ROL	1817	1818	1858	1859	2004	2005	2006	2007	2008	2025	2027	2029			
ROLB	2026	2028	2030												
ROR	1582	1584	1592	1612	1619	1802	1937	2106	2127						
RTS	1637	1643	1675	1729	1771	1843	1884	1945	1961	1990	2014	2045	2059		
SBC	524	597	598	599	656	713	714	715	793	874	875	876	939	1003	1004
	1005	1093	1156	1157	1158	1215	1272	1273	1274	1352	1432	1433	1434	1496	1560
	1561	1562													
SETD	2064	2093													
STD	571	595	603	701	711	719	841	865	880	984	994	1009	1130	1154	1162
	1260	1270	1278	1399	1423	1438	1541	1551	1566	2065	2066	2067	2068	2070	2072
	2095	2097													
STF	498	522	528	644	654	660	762	786	797	922	932	943	1057	1091	1097
	1203	1213	1219	1321	1345	1356	1479	1489	1500	1893					
STFPS	495	568	641	698	759	838	919	981	1054	1127	1200	1257	1318	1396	1475
	1538	1791	2063												
STST	1792														
SUB	523	596	655	712	792	873	938	1000	1092	1155	1214	1271	1351	1431	1495
	1559	1739	1773	1774	1777	1778	1897								
SUBD	1124	1256	1393	1537											
SUBF	1051	1199	1315	1475											
TRAP	390														
TST	432	493	566	757	836	1052	1125	1316	1394	1616	1661	1674	1798	1934	1939
	1992	2013													
TSTB	1604	1657	1671	1911	1921	1926	1941	1953	1975	2031	2034	2113	2116		
.ASCII	2132	2133													

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.ASCII  2106   2129   2130   2131   2134   2137
.ASECT   313
.BLKW   2047
.END    2154
.EVEN   2106   2140
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.IIFF    315
.IIFT    316
.IIFTF   317
.IRP     311   361   396   400   454   1571   1620   1801   1885   1938   2015   2060   2106   2110
.IRPC    320
.NARG    311   361   396   400   454   1571   1620   1801   1885   1938   2015   2060   2110
.NCHR    312

. ABS.  012154   000
        000000   001
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ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

*,DCFPSD.SEQ/SOL/CRF/PAGNUM=DCFPSD
RUN-TIME:  8 16 3 SECONDS
RUN-TIME RATIO: 539/28=18.9
CORE USED:  9K  (17 PAGES)
```

DOS

Spooler runtime 0 Seconds, 36 KPS, 209 disk reads, 3 disk writes, [illegible] pages