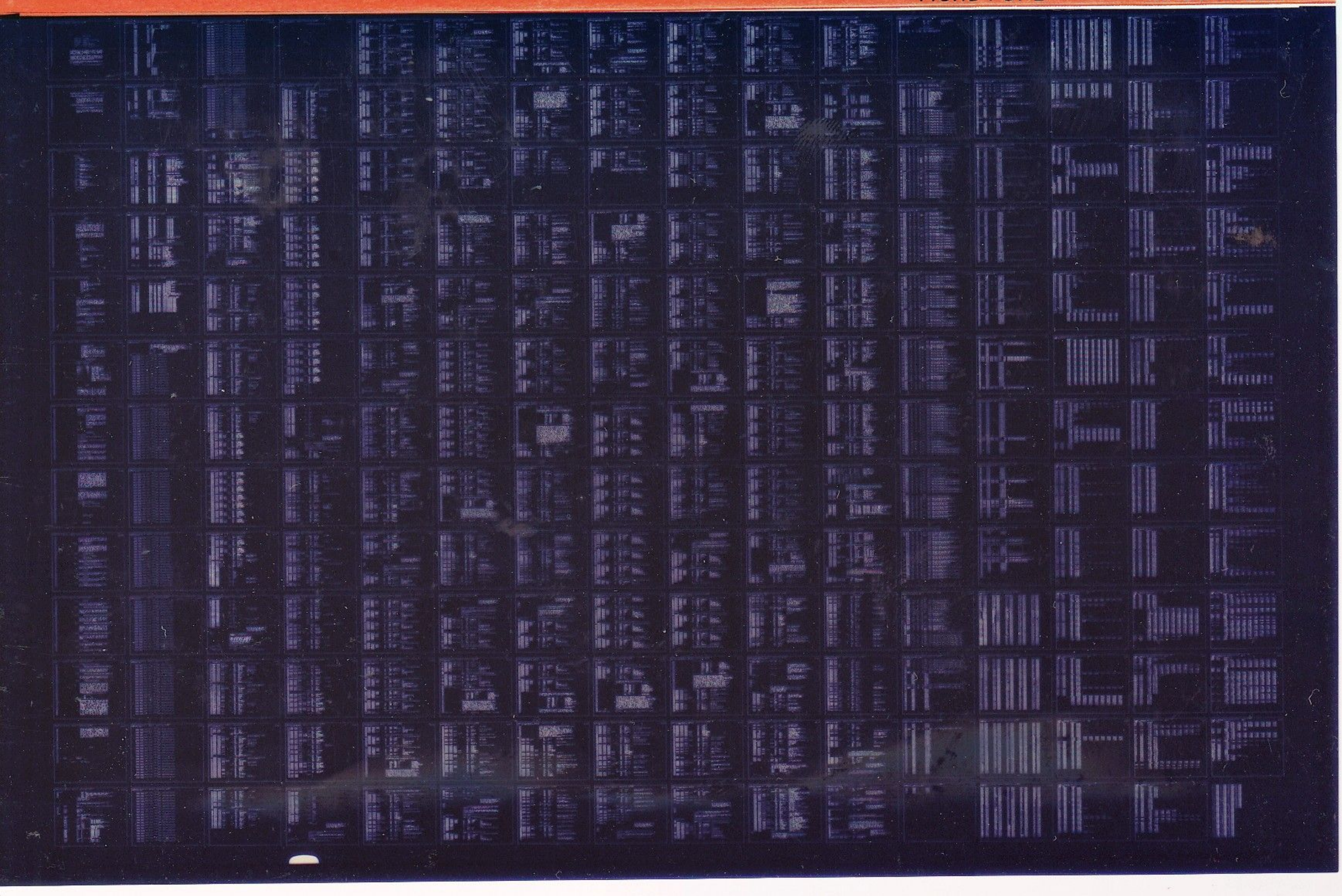
FP11-F

FP11F FLTG PNT B
CKFPBA0

AH-F635A-MC

FICHE 1 OF 2

JAN 1980
digital
MADE IN USA



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IDENTIFICATION

PRODUCT CODE: AC-F633A-MC

PRODUCT NAME: CKFPBA0 FP11F FLTG PNT PRT B

DATE CREATED: OCTOBER, 1979

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: ANTHONY VEZZA, DAN MILLEVILLE

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48
49                                  HISTORY
50                                  -------
51
52          NO CHANGES TO THE 11/34 FLOATING POINT DIAGNOSTICS PART 'A' WERE
53          FOUND TO BE NEEDE TO ADAPT IT FOR USE ON THE 11/44.
54
55          THE FOLLOWING WAS ADDED TO THE 11/34 FLOATING POINT DIAGNOSTIC
56          TO MAKE THE 'B' VERSION COVER THE 11/44:
57
58                  1. TEST 22 - PROCESSOR  LOOKS  TO SEE IF APT IS CON-
59                     TROLLING THE TEST, AND  IF  IT  IS, CHECKS TO SEE
60                     IF THE USER  HAS  SELECTED  THIS TEST BY CHECKING
61                     BIT 7 IN THE SWITCH REGISTER.  IT  HAS  ALSO BEEN
62                     CHANGED SO THAT IF BIT 7 IS *ONE*, THE CODE  WILL
63                     SELECT THE TEST.
64
65          THE FOLLOWING WAS ADDED TO THE 11/34 FLOATING POINT DIAGNOSTIC
66          TO MAKE THE 'C' VERSION COVER THE 11/44:
67
68                  1. TEST 76 - CHECKS THAT FP PROCESSOR DOESN'T ACCESS
69                     D-SPACE UNTIL CONDITIONS WARRANT.
70
71                  2. TEST 77 - CHECKS  THAT  SR1 MATCHES WHAT ACTUALLY
72                     HAPPENED TO THE REGISTER  OF THE INSTRUCTION, AND
73                     THAT THE VALUE  OF  AUTO  INCREMENT/DECREMENT WAS
74                     PROPER.
75
76
77
78
```

CONTENTS

1. ABSTRACT

THE THREE PROGRAMS:

CKFPAA0 CKFPBA0 CKFPCA0

ARE DESIGN TO DETECT AND REPORT LOGIC FAULTS IN THE PDP 11/44 FP11-F FLOATING POINT PROCESSOR. THE DESIGN IS AN ATTEMPT TO REACH ALL ROM STATES, TAKE ALL BRANCH MICRO TESTS (BUT'S) AND VARIFY ALL THE LOGIC. THEY CONSIST OF 157 (OCT) INDIVIDUAL TESTS SEQUENCED TO DETECT AND ATTEMPT TO IDENTIFY FAULTS WITH A MINIMUM HARDWARE OR SOFTWARE LEVEL. THE TESTS ARE PARTIONED INTO THREE STAND-ALONE PROGRAMS DESCRIBED BELOW.

NOTE THAT ERROR REPORTS IN THESE PROGRAMS ARE BASED UPON THE KNOWLEDGE THAT ALL PREVIOUS TESTS HAVE BEEN RUN AND IN MOST CASE THAT THERE IS ONLY A SINGLE POINT FAULT IN THE FP11-F. IF THE PROGRAMS OR TESTS ARE NOT RUN IN ORDER THEN ERROR MESSAGES MAY NOT BE ACCURATE.

A. CKFPAA0

CKFPAA0 TESTS:

- LDFPS
- STFPS
- CFCC
- SETF, SETD, SETI AND SETL
- STST
- LDF AND LDD (ALL SOURCE MODES)
- STD (MODE 0 AND 1)
- ADDF, ADDD AND SUBD (MOST CONDITIONS)

B. CKFPBA0

CKFPBA0 TESTS:

- ADDF, ADDD AND SUBD (ALL CONDITIONS NOT TESTED IN CKFPBA0)
- CMPD AND CMPF
- DIVD AND DIVF
- MULD AND MULF
- MODD AND MODF

C. CKFPCA0

CKFPCA0 TESTS:

- STF AND STD (ALL MODES)
- STCFD AND STCDF
- CLRD AND CLRF

```
                                    NEGF AND NEGD
                                    ABSF AND ABSD
                                    TSTF AND TSTD
                                    NEGF, ABSF AND TSTF (ALL SOURCE MODES)
                                    NEGF, ABSF AND TSTF (ALL SOURCE MODES)
                                    LDFPS (ALL SOURCE MODES)
                                    LDCIF AND LDCLF
                                    LDCID AND LDCLD
                                    LDEXP
                                    STFPS (ALL DESTINATION MODES)
                                    STCFL AND STCFI
                                    STCDL AND STCDI
                                    STEXP
                                    STST


2.                                  REQUIREMENTS
                                    ------------

2.1     EQUIPMENT

        A PDP 11/44 (WITH OR WITHOUT CONSOLE), LA30 (OR
        EQUIVALENT) AND AN FP11-F FLOATING POINT PROCESSOR.
        NOTE THAT A SPECIAL INTERRUPTS TEST MODULE IS BEING
        DESIGNED FOR USE IN THE MANUFACTURING ENVIRONMENT.
        WHEN THIS DEVICE IS PRESENT THE PROGRAM CKFPBA0 WILL
        MAKE USE OF IT TO TEST THE FPP INTERRUPT ON BUS
        REQUEST FUNCTIONS.

2.2     STORAGE

        ALL THREE PROGRAM REQUIRE A MEMORY SYSTEM OF AT
        LEAST 16K TO LOAD AND RUN.

2.3     PRELIMINARY PROGRAMS

        THESE THREE DIAGNOSTICS WILL ASSUME THAT THE PDP
        11/44 CENTRAL PROCESSOR IS FAULTLESS. THEREFORE WHEN
        IN DOUBT RUN THE PDP 11/44 PROCESSOR DIAGNOSTICS
        BEFORE THESE FP11-F DIAGNOSTICS.


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

        THE PROGRAMS WILL BE SUPPLIED ON THE 11/44
        DIAGNOSTIC MEDIA. REFER TO THE XXDP OPERATING
        MANUAL FOR FURTHER INFORMATION.

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

4.1     CONTROL SWITCH SETTINGS

        SEE SECTION 5.1

4.2     PROGRAM AND OPERATOR ACTION
```

1. LOAD PROGRAM INTO MEMORY
2. LOAD ADDRESS 200
3. SET CONSOLE SWITCHES (IF CONSOLE IS PRESENT)
4. PRESS START
   ON FIRST PASS THE PROGRAM WILL IDENTIFY ITSELF. NOTE THAT IF THERE IS NO PHYSICAL CONSOLE THE PROGRAM WILL REQUEST THE OPERATOR FOR INITIAL VALUE FOR THE SOFTWARE SWITCH REGISTER (SEE SECTION 8.5). IF RUNNING UNDER ACT, APT OR CHAIN THIS DOES NOT APPLY.
5. THE PROGRAM WILL LOOP AND AN END OF PASS AND ERROR SUMMARY WILL BE TYPED AT THE END OF EVERY PASS.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

THE SWITCH SETTING ARE:

	OCTAL	
SW<15>-1...	100000	HALT ON ERROR
SW<14> 1...	40000	LOOP ON CURRENT TEST
SW<13>-1...	20000	INHIBIT ERROR TYPE OUTS
SW<12>=1...	10000	INHIBIT T-BIT TRAPPING
SW<11>=1...	4000	INHIBIT ITERATIONS
SW<10>=1...	2000	RING TTY BELL ON ERROR
SW<9>=1....	1000	LOOP ON ERROR
SW<8> 1....	400	LOOP ON TEST SPECIFIED IN SW<6> THROUGH SW<0>
SW<7>=1....	200	PRINT ERROR SUMMARY EVEN IF SW<13>=1. THIS APPLIES ONLY TO PROGRAM CKFPAA0.
SW<7> 1....	200	SELECT CORRECT INTERRUPT TEST IN PROGRAM CKFPBA0. IF APT IS SELECTING THE TEST, THE SWITCH REGISTER IS EXAMINED TO SEE IF THE USER HAS SELECTED THIS TEST BY A <1> IN SW<7>

6. ERRORS

6.1 SUMMARIES

IN PROGRAM CKFPAA0, TESTS 1 AND 11 HAVE A SPECIAL ERROR SUMMARY FEATURE. THESE TWO TEST RUN MANY TEST PATTERNS THROUGH THE LOGIC. AFTER AN ERROR IS ENCOUNTERED, ONLY THE FIRST FIVE ERRORS ARE REPORTED (TYPED ON THE TTY). EVERY ERROR THOUGH IS LOGGED AND AN ERROR SUMMARY IS PRINTED WHEN THE TEST IS COMPLETE. NOTE THAT IF SW<13>-1 THIS

SUMMARY WILL NOT BE TYPED UNLESS SW<7>=1. IN OTHER WORDS TO GET JUST AN ERROR SUMMARY FROM EITHER OF THESE TWO TESTS 1 AND 11 IN PROGRAM CKFPAA0 BOTH SWITCHES 13 AND 7 MUST = 1.

6.2 ERROR RECOVERY

SW<15:9>=0... MOST ERRORS WILL CAUSE EXECUTION TO GO TO THE START OF THE NEXT TEST AFTER THE MESSAGE IS TYPED. A FEW TESTS ARE IN SECTIONS. IN THESE TESTS AN ERROR WILL CAUSE EXECUTION TO GO TO THE NEXT SECTION AFTER THE MESSAGE IS TYPED.

SW<15>=1... THE PROGRAM WILL HALT AFTER TYPING THE ERROR MESSAGE. PRESSING THE CONSOLE CONTINUE WILL CAUSE THE PROGRAM TO CONTINUE AS IF SW<15>=0.

7. RESTRICTIONS

NONE

8. MISCELLANEOUS

8.1 EXECUTION TIMES

LESS THAN 10 SECONDS FOR EACH PROGRAM ON ANY PASS.

8.2 STACK POINTER

THE STACK POINTER IS INITIALIZED TO 1100 IN EACH OF THE THREE PROGRAMS.

8.3 PASS COUNT

THE PROGRAM MAKES ONE PASS FOR EACH END OF PASS MESSAGE TYPED. THE END OF PASS MESSAGE DESCRIBES THE TOTAL NUMBER OF PASSES COMPLETED AND THE TOTAL NUMBER OF ERRORS SINCE THE LAST END OF PASS MESSAGE.

8.4 T-BIT TRAPPING

IF SW<12>=0 EACH PROGRAM WILL RUN WITH TRACE TRAPS ON EVERY OTHER PASS. FIRST PASS WILL NOT ENABLE TRACE TRAPS. NOTE SW<12>=1 DISABLES T-BIT TRAPS.

8.5 SOFTWARE SWITCH REGISTER

EACH OF THE THREE PROGRAMS WILL RUN WITH OR WITHOUT A CONSOLE SWITCH REGISTER. IF A PHYSICAL CONSOLE SWITCH REGISTER IS PRESENT ON THE SYSTEM, THEN THESE PROGRAMS WILL GO AHEAD AND USE IT FOR THE SWITCH

FUNCTIONS DESCRIBED IN 5.1 ABOVE. IF HOWEVER THERE IS NO CONSOLE SWITCH REGISTER ON THE SYSTEM A SOFTWARE SWITCH REGISTER WILL BE USED. THIS SOFTWARE SWITCH REGISTER CAN BE EXAMINED OR MODIFIED AT ANY TIME BY THE USER IF HE TYPES CONTROL G WHILE THE PROGRAM IS RUNNING. THIS CONTROL G WILL CAUSE THE CONTENTS OF THE SOFTWARE SWITCH REGISTER TO BE TYPED ON THE TTY AND ASK THE USER FOR A NEW VALUE. WHEN THE USER TYPES A VALUE AND CARRIAGE RETURN THEN THE PROGRAM WILL RESUME TESTING AT THE SAME POINT AT WHICH IT LEFT OFF WHEN THE USER TYPED CONTROL G. NOTE THAT WHEN NOT RUNNING UNDER ACT, APT OR CHAIN THE USER WILL BE ASKED FOR A SOFTWARE SWITCH REGISTER VALUE AFTER LOADING ADDRESS 200 AND STARTING THE PROGRAM THE FIRST TIME THE PROGRAM IS RUN AFTER LOADING (ONLY IF NO CONSOLE SWITCH REGISTER IS ON THE SYSTEM).

8.6 INTERRUPTS TEST

IN PROGRAM CKFPBA0, THERE IS A SPECIAL TEST FOR CHECKING THE CORRECT FLOWS OF THE FPP. THIS TEST CAN BE RUN ONLY IF A SPECIAL TEST MODULE IS IN THE SYSTEM. THIS MODULE WILL PROBABLY ONLY BE USED IN MANUFACTURING. IF THIS MODULE IS NOT IN THE SYSTEM THIS TEST WILL AUTOMATICALLY BE DESELECTED. IF THIS TEST MODULE IS ON THE SYSTEM AND SW<7>=0 THIS TEST WILL BE RUN. IF SW<7>=1 THIS TEST WILL BE DESELECTED.

8.7 ACT, APT AND XXDP COMPATIBILITY

THESE PROGRAMS ARE FULLY COMPATIBLE WITH:
- APT
- ACT
- XXDP MONITOR AND CHAIN PROGRAMS.

9. PROGRAM DESCRIPTION

TEST 1 ROUND\TRUNK TEST

```
                        THIS IS A TEST OF THE ROUND\TRUNK FLOWS.  IN
                        PARTICULAR TWO THINGS ARE TESTED:  FIRST A CONDITION
                        IN WHICH ROUNDING RESULTS IN THE NEED FOR
                        RENORMALIZATION, AND SECOND THE PSW CONDITION CODES
                        N AND Z BIT COMBINATIONS

TEST 2          OVER\UNDER TEST
------          ---------------

                        THIS IS A PARTIAL TEST OF THE OVER\UNDER FLOWS.  ONE
                        OVERFLOW AND TWO UNDERFLOW CONDITIONS ARE CHECKED.
                        THE REMAINING UNDERFLOW COND.  AND THE REMAINING
                        OVERFLOW COND. WILL BE CHECKED LATER USING THE XXX
                        INSTRUCTION.  HERE EACH CONDITION TESTED IS CHECKED
                        BOTH WITH TRAPS ENABLED (FIU=1 OR FIV 1) AND ALSO
                        WITH TRAPS DISABLED (FIU=0 OR FIV=0).

TEST 3          LDCFD AND LDCDF TEST
------          --------------------

                        THIS IS A TEST OF LDCFD AND LDCDF.

TEST 4          CMPD TEST
------          ---------

                        THIS IS A TEST OF THE CMPD INSTRUCTION.  NOTE THAT A
                        SUBROUTINE IS USED TO SET UP OPERANDS, EXECUTE THE
                        INSTRUCTION AND CHECK THE RESULTS

TEST 5          DIVD WITH (FSRC 0) AND (BUT FD) TEST
------          ------------------------------------

                        THIS IS A TEST OF THE DIVD INSTRUCTION WITH A ZERO
                        DIVISOR.  THE CONDITION IS CHECKED WITH BOTH TRAP
                        ENABLED AND TRAPS DISABLED.

TEST 6          DIVF TEST
------          ---------

                        THIS IS A TEST OF THE DIVF INSTRUCTION.  NOTE THAT A
                        SUBROUTINE IS USED TO SET UP THE OPERANDS, EXECUTE
                        THE INSTRUCTION AND CHECK THE RESULTS.

TEST 7          DIVD TEST
------          ---------

                        THIS IS A TEST OF THE DIVD INSTRUCTION.  NOTE THAT A
                        SUBROUTINE IS USED TO SET UP THE OPERANDS, EXECUTE
                        THE INSTRUCTION AND CHECK THE RESULTS.

TEST 10         MULF TEST
------          ---------
                        THIS IS A TEST OF THE MULF INSTRUCTION.  IT MAKES
                        USE OF A SUBROUTINE TO SET UP THE OPERANDS, EXECUTE
                        THE MULF INSTRUCTION AND CHECK THE RESULTS.
```

```
                        TEST 11         MULD TEST
                        -------         ---------

                                THIS IS A TEST OF THE MULD INSTRUCTION.  NOTE THAT A
                                SUBROUTINE  IS  USED TO SET UP THE OPERANDS, EXECUTE
                                THE MULD INSTRUCTION AND CHECK THE RESULTS.

                        TEST 12         UNDER\OVER FLOW, USING MULF WITH TRAPS DISABLED, TEST
                        -------         ----------------------------------------------------

                                THIS  IS  A  TEST  OF  THE  OVERFLOW  AND  UNDERFLOW
                                CONDITIONS  USING  THE  MULF  INSTRUCTION WITH TRAPS
                                DISABLED.  NOTE THAT A SUBROUTINE IS USED TO SET  UP
                                THE OPERANDS, EXECUTE THE MULF INSTRUCTION AND CHECK
                                THE RESULTS.

                        TEST 13         UNDER\OVER FLOW, USING MULD WITH TRAPS DISABLED, TEST
                        -------         ----------------------------------------------------

                                THIS  IS  A  TEST  OF  THE  OVERFLOW  AND  UNDERFLOW
                                CONDITIONS   THAT   CAN   ARRISE   USING   THE  MULD
                                INSTRUCTION WITH TRAPS DISABLED.   A  SUBROUTINE  IS
                                USED  TO  SET  UP  THE  OPERANDS,  EXECUTE  THE MULD
                                INSTRUCTION AND CHECK THE RESULTS.

                        TEST 14         UNDER\OVER FLOW, USING MULF WITH TRAPS ENABLED, TEST
                        -------         ----------------------------------------------------

                                THIS  IS  A  TEST  OF  THE  UNDERFLOW  AND  OVERFLOW
                                CONDITIONS   THAT   CAN   OCCUR   USING   THE   MULF
                                INSTRUCTION.  A SUBROUTINE IS CALLED TO SET  UP  THE
                                OPERANDS, EXECUTE THE MULF INSTRUCTION AND CHECK THE
                                RESULTS.   HERE  THE  PARTICULAR  INTERRUPT,  EITHER
                                OVERFLOW  OR  UNDERFLOW, IS ENABLED SO A TRAP SHOULD
                                OCCUR.

                        TEST 15         UNDER\OVER FLOW, USING MULD WITH TRAPS ENABLED, TEST
                        -------         ----------------------------------------------------

                                THIS IS A TEST OF  THE  OVER  FLOW  AND  UNDER  FLOW
                                CONDITIONS  USING  THE  MULD  INSTRUCTION WITH TRAPS
                                ENABLED.   A  SUBROUTINE  IS  USED  TO  SET  UP  THE
                                OPERANDS, EXECUTE THE MULD INSTRUCTION AND CHECK THE
                                RESULTS.

                        TEST 16         MODF TEST
                        -------         ---------

                                THIS IS A TEST OF THE MODF INSTRUCTION, WHICH  MAKES
                                USE  OF A SUBROUTINE TO SET UP THE OPERANDS, EXECUTE
                                THE MODF INSTRUCTION AND CHECK THE RESULTS.

                        TEST 17         MODD TEST
                        -------         ---------

                                THIS IS A TEST OF THE MODD  INSTRUCTION.   IT  MAKES
                                USE OF A SUBROUTINE TO SET UP THE ARGUMENTS, EXECUTE
```

```
                        THE INSTRUCTION AND CHECK THE RESULTS.

TEST 20         UNDER\OVER FLOW, USING MODF WITH TRAPS DISABLED, TEST
-------         ----------------------------------------------------

                THIS IS A TEST OF THE MODF  OVERFLOW  AND  UNDERFLOW
                CONDITIONS.   IT  MAKES USE OF A SUBROUTINE TO SETUP
                THE OPERANDS, EXECUTE THE MODF INSTRUCTION AND CHECK
                THE RESULTS.  TRAPS ARE DISABLED DURING THIS TEST.

TEST 21         UNDFR\OVER FLOW, USING MODD WITH TRAPS DISABLED, TEST
-------         ----------------------------------------------------

                THIS IS A TEST OF THE MODD INSTRUCTION'S  OVER  FLOW
                AND  UNDER FLOW CONDITIONS.  A SUBROUTINE IS USED TO
                SET UP THE OPERANDS, EXECUTE THE MODD INSTUCTION AND
                CHECK THE RESULTS.

TEST 22         INTERRUPT CORRECT FLOWS TEST
-------         ----------------------------

                THIS IS A TEST OF THE 'CORRECT' FLOWS.  THIS PART OF
                THE  MICRO  CODE  HAS  AS  ITS PURPOSE INSURING THAT
                INTERRUPT REQUESTS MADE DURING CERTAIN  LENGTHY  FPP
                INSTRUCTIONS  GET  HONORED.   THIS  IS DONE IN A WAY
                SUCH THAT IF AN INTERRUPT REQUEST OCCURS DURING  ONE
                OF    THESE    INSTRUCTIONS    THE    STATE    OF    THAT
                INSTRUCTION'S EXECUTION WILL BE THE SAME AS IF  THAT
                INSTRUCTION HAD NEVER BEEN FETCHED AND ITS EXECUTION
                NEVER STARTED.  THUS THE MICRO CODE WILL RESTORE ALL
                REGISTERS,  BACK UP THE PC AND LEAVE THE FPS AND AC0
                THROUGH AC5 UNMODIFIED.
                THE INSTRUCTIONS FOR WHICH THIS IS NECESSARY ARE:

                        ADD (OR SUB)
                        DIV
                        MUL
                        MOD
                (BOTH DOUBLE AND FLOATING)

                ALL ADDRESSING MODES WILL BE  TRIED  WITH  THE  ADDD
                INSTRUCTION.   THEN  EACH  OF THE OTHER INSTRUCTIONS
                WILL BE TRIED USING MODE 1.   NOTE  THAT  THIS  TEST
                NEEDS   A   SPECIAL  INTERRUPT  MODULE,  WHICH  WILL
                PROBABLY ONLY  BE  PRESENT  IN  DEC'S  MANUFACTURING
                ENVIRONMENT,  TO  RUN.   THIS  SPECIAL  EQUIPMENT IS
                DESIGNED  TO  RAISE  AN  INTERRUPT  REQUEST  IN  THE
                PROCESSOR IF A BIT IS SET IN ITS STATUS REGISTER AND
                ONLY  WHEN  AN  FPP  INSTRUCTION    IS    ENCOUNTERED.
                THEREFORE   THIS  TEST  WILL  BE  RUN  CONDITIONALLY
                (DEPENDENT UPON WHETHER OR NOT THE  STATUS  REGISTER
                OF  THE  TEST  EQUIPMENT TIMES OUT WHEN REFERENCED).
                THIS TEST CAN ALSO BE SELECTED  BY  TURNING SWITCH 7
                OF  THE  SWITCH  REGISTER  (PHYSICAL OR VIRTUAL) ON.
                THE TEST ASSUMES THAT THE  TEST  EQUIPMENT'S  STATUS
                REGISTER  IS  AT  LOCATION  777774  (NOTE  THAT  ALL
                REFERENCES  TO  THIS  LOCATION  ARE  MADE    INDIRECT
```

```
                        THROUGH  THIS  PROGRAMS  LOCATION CORINT, SO THAT IF
                        THE USER HAS MODIFIED THE  TEST  EQUIPMENT'S  STATUS
                        REGISTER  TO RESPOND TO A DIFFERENT ADDRESS LOCATION
                        CORINT  MUST  BE  MADE  TO  CONTAIN  THAT  STATUS
                        REGIS"ER'S  NEW ADDRESS).  THIS PROGRAM ASSUMES THAT
                        THE TRAP VECTOR  FOR  THE  TEST  EQUIPMENT  IS  110.
                        AGAIN  NOTE  THAT ALL REFERENCES TO THIS TRAP VECTOR
                        ARE INDIRECT, THROUGH THIS PROGRAM'S LOCATION CORTRP
                        (IF  THE  TEST  EQUIPMENT  IS  MADE  TO  TRAP  TO  A
                        DIFFERENT VECTOR LOCATION CORTRP  MUST  CONTAIN  THE
                        ADDRESS OF THIS VECTOR).




                10.                     LISTING
                                        -------




                                &

000266                          MNUMBER=266
00000?                          PROGNUM=2


                ...                     .LIST   ME
                                        .NLIST  MD,MC,CND
```

```
856 000000                              .ENABL  ABS
863                                     .MCALL  .HEADER,.SWRHI,.EQUAT,.SETUP,.$CATCH,.$ACT11,.$CMTAG
864                                     .MCALL  .$EOP,.$SCOPE,.$ERROR,.$SAVE,.$TYPE,.$TYPOCT
865                                     .MCALL  .$TYPDEC,.$TRAP,.$POWER,.$APTHDR,.$APTBLS
866                                     .MCALL  .$APTYPE,.$READ
867                                     .MCALL  .EQUIV                  ;REMOVE FOR PDP-10 ASSEMBLY
868                             .TITLE  CKFPBA0 FP11F FLTG PNT PRT B
                                ;*COPYRIGHT (C) 1979
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*
        000001                  $TN-1
        160000                  $SWR=160000     ;;HALT ON ERROR, LOOP ON TEST, INHIBIT ERROR TYPOUT
869
870
871     000244                  FPVECT=244
872     177400                  $SWR-177400
873     000200                  $SWRMSK=200
874     000011                  TAB=11
875     000015                  CRLF=15
876
877                             .SBTTL  BASIC DEFINITIONS
                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
        001100                  STACK=  1100
        104000                          ERROR=EMT
        000004                          SCOPE-IOT
                                ;*MISCELLANEOUS DEFINITIONS
        000011                  HT      11              ;;CODE FOR HORIZONTAL TAB
        000012                  LF=     12              ;;CODE FOR LINE FEED
        000015                  CR=     15              ;;CODE FOR CARRIAGE RETURN
        000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
        177776                  PS-     177776          ;;PROCESSOR STATUS WORD
        177776                          PSW-PS
        177774                  STKLMT= 177774          ;;STACK LIMIT REGISTER
        177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
        177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
        177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
                                ;*GENERAL PURPOSE REGISTER DEFINITIONS
        000000                  R0=     %0              ;;GENERAL REGISTER
        000001                  R1      %1              ;;GENERAL REGISTER
        000002                  R2-     %2              ;;GENERAL REGISTER
        000003                  R3-     %3              ;;GENERAL REGISTER
        000004                  R4      %4              ;;GENERAL REGISTER
        000005                  R5      %5              ;;GENERAL REGISTER
        000006                  R6=     %6              ;;GENERAL REGISTER
        000007                  R7=     %7              ;;GENERAL REGISTER
        000006                  SP-     %6              ;;STACK POINTER
        000007                  PC=     %7              ;;PROGRAM COUNTER
                                ;*PRIORITY LEVEL DEFINITIONS
        000000                  PR0=    0               ;;PRIORITY LEVEL 0
        000040                  PR1=    40              ;;PRIORITY LEVEL 1
        000100                  PR2=    100             ;;PRIORITY LEVEL 2
        000140                  PR3=    140             ;;PRIORITY LEVEL 3
```

```
000200                  PR4=    200             ;;PRIORITY LEVEL 4
000240                  PR5=    240             ;;PRIORITY LEVEL 5
000300                  PR6=    300             ;;PRIORITY LEVEL 6
000340                  PR7=    340             ;;PRIORITY LEVEL 7
                        ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW09-   1000
000400                  SW08=   400
000200                  SW07=   200
000100                  SW06=   100
000040                  SW05=   40
000020                  SW04=   20
000010                  SW03=   10
000004                  SW02=   4
000002                  SW01=   2
000001                  SW00=   1
001000                          SW9=SW09
000400                          SW8=SW08
000200                          SW7=SW07
000100                          SW6=SW06
000040                          SW5=SW05
000020                          SW4=SW04
000010                          SW3=SW03
000004                          SW2=SW02
000002                          SW1=SW01
000001                          SW0=SW00
                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT09=  1000
000400                  BIT08=  400
000200                  BIT07=  200
000100                  BIT06=  100
000040                  BIT05=  40
000020                  BIT04=  20
000010                  BIT03=  10
000004                  BIT02=  4
000002                  BIT01=  2
000001                  BIT00-  1
001000                          BIT9=BIT09
000400                          BIT8=BIT08
000200                          BIT7=BIT07
000100                          BIT6=BIT06
000040                          BIT5=BIT05
000020                          BIT4=BIT04
000010                          BIT3=BIT03
000004                          BIT2-BIT02
000002                          BIT1-BIT01
```

```
                000001                          BIT0=BIT00
                                        ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
                000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
                000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
                000014                  TBITVEC=14              ;;''T'' BIT
                000014                  TRTVEC= 14              ;;TRACE TRAP
                000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
                000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
                000024                  PWRVEC= 24              ;;POWER FAIL
                000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
                000034                  TRAPVEC=34              ;;''TRAP'' TRAP
                000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
                000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
                000240                  PIRQVEC=240             ;,PROGRAM INTERRUPT REQUEST VECTOR
    878                                         .SBTTL  FPP REGISTER DEFINITIONS
    879         000000                  AC0     =%0
    880         000001                  AC1     =%1
    881         000002                  AC2     =%2
    882         000003                  AC3     =%3
    883         000004                  AC4     =%4
    884         000005                  AC5     =%5
    885         000006                  AC6     =%6
    886         000007                  AC7     =%7
    888
    889                                 .SBTTL  TRAP CATCHER
                000000                          .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                000174                          .=174
      000174    000000                  DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
      000176    000000                  SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                        .SBTTL  STARTING ADDRESS(ES)
      000200    000137  004336                  JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
```

```
    890                             .SBTTL  COMMON TAGS
                                    ;;*****************************************************************
                                    ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
                                    ;*USED IN THE PROGRAM.
            001100                          .=1100
    001100                          $CMTAG:                         ;;START OF COMMON TAGS
    001100  000000                          .WORD   0
    001102     000                  $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
    001103     000                  $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
    001104  000000                  $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
    001106  000000                  $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
    001110  000000                  $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
    001112  000000                  $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
    001114     000                  $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
    001115     001                  $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
    001116  000000                  $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
    001120  000000                  $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
    001122  000000                  $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
    001124  000000                  $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
    001126  000000                  $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
    001130  000000                          .WORD   0               ;;RESERVED--NOT TO BE USED
    001132  000000                          .WORD   0
    001134     000                  $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
    001135     000                  $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
    001136  000000                          .WORD   0
    001140  177570                  SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
    001142  177570                  DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
    001144  177560                  $TKS:   177560                  ;;TTY KBD STATUS
    001146  177562                  $TKB:   177562                  ;;TTY KBD BUFFER
    001150  177564                  $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
    001152  177566                  $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
    001154     000                  $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
    001155     002                  $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
    001156     012                  $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED''
    001157     000                  $TPFLG: .BYTE   0               ;;'TERMINAL AVAILABLE'' FLAG (BIT<07>=0 YES)
    001160  000000                  $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                                    ;;WHICH  ($REG0) WAS OBTAINED
            000024                          .REPT   $CM3
    001162  000000                  $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
    001164  000000                  $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
    001166  000000                  $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
    001170  000000                  $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
    001172  000000                  $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
    001174  000000                  $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
    001176  000000                  $REG6:  .WORD   0               ;;CONTAINS (($REGAD)+14)
    001200  000000                  $REG7:  .WORD   0               ;;CONTAINS (($REGAD)+16)
    001202  000000                  $REG10: .WORD   0               ;;CONTAINS (($REGAD)+20)
    001204  000000                  $REG11: .WORD   0               ;;CONTAINS (($REGAD)+22)
    001206  000000                  $REG12: .WORD   0               ;;CONTAINS (($REGAD)+24)
    001210  000000                  $REG13: .WORD   0               ;;CONTAINS (($REGAD)+26)
    001212  000000                  $REG14: .WORD   0               ;;CONTAINS (($REGAD)+30)
    001214  000000                  $REG15: .WORD   0               ;;CONTAINS (($REGAD)+32)
    001216  000000                  $REG16: .WORD   0               ;;CONTAINS (($REGAD)+34)
    001220  000000                  $REG17: .WORD   0               ;;CONTAINS (($REGAD)+36)
    001222  000000                  $REG20: .WORD   0               ;;CONTAINS (($REGAD)+40)
    001224  000000                  $REG21: .WORD   0               ;;CONTAINS (($REGAD)+42)
    001226  000000                  $REG22: .WORD   0               ;;CONTAINS (($REGAD)+44)
```

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001230  000000                  $REG23: .WORD   0               ;;CONTAINS ((SREGAD)+46)
        000024                  .REPT   24
001232  000000                  $TMP0:  .WORD   0               ;;USER DEFINED
001234  000000                  $TMP1:  .WORD   0               ;;USER DEFINED
001236  000000                  $TMP2:  .WORD   0               ;;USER DEFINED
001240  000000                  $TMP3:  .WORD   0               ;;USER DEFINED
001242  000000                  $TMP4:  .WORD   0               ;;USER DEFINED
001244  000000                  $TMP5:  .WORD   0               ;;USER DEFINED
001246  000000                  $TMP6:  .WORD   0               ;;USER DEFINED
001250  000000                  $TMP7:  .WORD   0               ;;USER DEFINED
001252  000000                  $TMP10: .WORD   0               ;;USER DEFINED
001254  000000                  $TMP11: .WORD   0               ;;USER DEFINED
001256  000000                  $TMP12: .WORD   0               ;;USER DEFINED
001260  000000                  $TMP13: .WORD   0               ;;USER DEFINED
001262  000000                  $TMP14: .WORD   0               ;;USER DEFINED
001264  000000                  $TMP15: .WORD   0               ;;USER DEFINED
001266  000000                  $TMP16: .WORD   0               ;;USER DEFINED
001270  000000                  $TMP17: .WORD   0               ;;USER DEFINED
001272  000000                  $TMP20: .WORD   0               ;;USER DEFINED
001274  000000                  $TMP21: .WORD   0               ;;USER DEFINED
001276  000000                  $TMP22: .WORD   0               ;;USER DEFINED
001300  000000                  $TMP23: .WORD   0               ;;USER DEFINED
001302  000000                  $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001304  000000                  $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001306     207     377     377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BEL_
001311     000
001312     077                  $QUES:  .ASCII  /?/             ;;QUESTION MARK
001313     015                  $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001314     012     000          $LF:    .ASCIZ  <12>            ;;LINE FEED
                                ;;**************************************************************
                                .SBTTL  APT MAILBOX-ETABLE
                                ;;**************************************************************
                                .EVEN
001316                          $MAIL:                          ;;APT MAILBOX
001316  000000                  $MSGTY: .WORD   AMSGTY          ;;MESSAGE TYPE CODE
001320  000000                  $FATAL: .WORD   AFATAL          ;;FATAL ERROR NUMBER
001322  000000                  $TESTN: .WORD   ATESTN          ;;TEST NUMBER
001324  000000                  $PASS:  .WORD   APASS           ;;PASS COUNT
001326  000000                  $DEVCT: .WORD   ADEVCT          ;;DEVICE COUNT
001330  000000                  $UNIT:  .WORD   AUNIT           ;;I/O UNIT NUMBER
001332  000000                  $MSGAD: .WORD   AMSGAD          ;;MESSAGE ADDRESS
001334  000000                  $MSGLG: .WORD   AMSGLG          ;;MESSAGE LENGTH
001336                          $ETABLE:                        ;;APT ENVIRONMENT TABLE
001336     000                  $ENV:   .BYTE   AENV            ;;ENVIRONMENT BYTE
001337     000                  $ENVM:  .BYTE   AENVM           ;;ENVIRONMENT MODE BITS
001340  000000                  $SWREG: .WORD   ASWREG          ;;APT SWITCH REGISTER
001342  000000                  $USWR:  .WORD   AUSWR           ;;USER SWITCHES
001344  000000                  $CPUOP: .WORD   ACPUOP          ;;CPU TYPE,OPTIONS
                                ;*                              BITS 15-11=CPU TYPE
                                ;*                                      11/04=01,11/05=02,11/20-03,11/40-04,11/45=05
                                ;*                                      11/70=06,PDQ=07,Q=10
                                ;*                              BIT 10=REAL TIME CLOCK
                                ;*                              BIT  9=FLOATING POINT PROCESSOR
                                ;*                              BIT  8=MEMORY MANAGEMENT
001346     000                  $MAMS1: .BYTE   AMAMS1          ;;HIGH ADDRESS,M.S. BYTE
001347     000                  $MTYP1: .BYTE   AMTYP1          ;;MEM. TYPE,BLK#1
                                ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
```

```
                                        ;*                              900 NSEC CORE=001
                                        ;*                              300 NSEC BIPOLAR=002
                                        ;*                              500 NSEC MOS=003
001350  000000                          $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                                        ;*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
001352      000                         $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
001353      000                         $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
001354  000000                          $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
001356      000                         $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
001357      000                         $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
001360  000000                          $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
001362      000                         $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
001363      000                         $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
001364  000000                          $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
001366  000000                          $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001370  000000                          $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001372  000000                          $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001374  000000                          $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
001376  000000                          $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
001400  000000                          $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
001402  000000                          $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
001404  000000                          $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
001406  000000                          $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
001410  000000                          $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
001412  000000                          $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
001414  000000                          $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
001416  000000                          $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
001420  000000                          $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
001422  000000                          $DDW8:  .WORD   ADDW8   ;;DEVICE DESCRIPTOR WORD#8
001424  000000                          $DDW9:  .WORD   ADDW9   ;;DEVICE DESCRIPTOR WORD#9
001426  000000                          $DDW10: .WORD   ADDW10  ;;DEVICE DESCRIPTOR WORD#10
001430  000000                          $DDW11: .WORD   ADDW11  ;;DEVICE DESCRIPTOR WORD#11
001432  000000                          $DDW12: .WORD   ADDW12  ;;DEVICE DESCRIPTOR WORD#12
001434  000000                          $DDW13: .WORD   ADDW13  ;;DEVICE DESCRIPTOR WORD#13
001436  000000                          $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
001440  000000                          $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15
001442                                  $ETEND:
```

```
                                        .SBTTL  ERROR POINTER TABLE
                                        ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                        ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                        ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                        ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                                        ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
                                        ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                        ;*      DH              ;;POINTS TO THE DATA HEADER
                                        ;*      DT              ;;POINTS TO THE DATA
                                        ;*      DF              ;;POINTS TO THE DATA FORMAT
    001442                              $ERRTB:
894             000266                          .REPT   MNUMBER
896                                     ;ITEM 1
    001442  037724  066262  070604              .WORD   EM1,DH1,DT1,DF1
    001450  070056
                                        ;ITEM 2
    001452  037756  066352  070642              .WORD   EM2,DH2,DT2,DF2
    001460  070074
                                        ;ITEM 3
    001462  040012  066262  070604              .WORD   EM3,DH3,DT3,DF3
    001470  070056
                                        ;ITEM 4
    001472  040117  066262  070604              .WORD   EM4,DH4,DT4,DF4
    001500  070056
                                        ;ITEM 5
    001502  040224  066262  070604              .WORD   EM5,DH5,DT5,DF5
    001510  070056
                                        ;ITEM 6
    001512  040331  066262  070604              .WORD   EM6,DH6,DT6,DF6
    001520  070056
                                        ;ITEM 7
    001522  040436  066262  070604              .WORD   EM7,DH7,DT7,DF7
    001530  070056
                                        ;ITEM 10
    001532  040543  066262  070604              .WORD   EM10,DH10,DT10,DF10
    001540  070056
                                        ;ITEM 11
    001542  040650  066262  070604              .WORD   EM11,DH11,DT11,DF11
    001550  070056
                                        ;ITEM 12
    001552  040757  066262  070604              .WORD   EM12,DH12,DT12,DF12
    001560  070056
                                        ;ITEM 13
    001562  041066  066262  070604              .WORD   EM13,DH13,DT13,DF13
    001570  070056
                                        ;ITEM 14
    001572  041202  066262  070604              .WORD   EM14,DH14,DT14,DF14
    001600  070056
                                        ;ITEM 15
    001602  041314  066262  070604              .WORD   EM15,DH15,DT15,DF15
    001610  070056
                                        ;ITEM 16
    001612  041426  066262  070604              .WORD   EM16,DH16,DT16,DF16
    001620  070056
                                        ;ITEM 17
    001622  041523  06641?  070670              .WORD   EM17,DH17,DT17,DF17
    001630  070106
```

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                                        ;ITEM 20
001632  041600  066262  070710                .WORD   EM20,DH20,DT20,DF20
001640  070115
                                        ;ITEM 21
001642  041632  066466  070732                .WORD   EM21,DH21,DT21,DF21
001650  070115
                                        ;ITEM 22
001652  041664  066555  070754                .WORD   EM22,DH22,DT22,DF22
001660  070115
                                        ;ITEM 23
001662  041745  066262  070772                .WORD   EM23,DH23,DT23,DF23
001670  070125
                                        ;ITEM 24
001672  042022  066262  070772                .WORD   EM24,DH24,DT24,DF24
001700  070125
                                        ;ITEM 25
001702  042120  066262  070772                .WORD   EM25,DH25,DT25,DF25
001710  070125
                                        ;ITEM 26
001712  042205  066262  070772                .WORD   EM26,DH26,DT26,DF26
001720  070125
                                        ;ITEM 27
001722  042120  066262  070772                .WORD   EM27,DH27,DT27,DF27
001730  070125
                                        ;ITEM 30
001732  042303  066262  070772                .WORD   EM30,DH30,DT30,DF30
001740  070125
                                        ;ITEM 31
001742  042355  066262  070772                .WORD   EM31,DH31,DT31,DF31
001750  070125
                                        ;ITEM 32
001752  041770  066262  070772                .WORD   EM32,DH32,DT32,DF32
001760  070125
                                        ;ITEM 33
001762  042422  066262  070772                .WORD   EM33,DH33,DT33,DF33
001770  070151
                                        ;ITEM 34
001772  042445  066262  070772                .WORD   EM34,DH34,DT34,DF34
002000  070151
                                        ;ITEM 35
002002  042477  066262  070772                .WORD   EM35,DH35,DT35,DF35
002010  070151
                                        ;ITEM 36
002012  042552  066262  070772                .WORD   EM36,DH36,DT36,DF36
002020  070151
                                        ;ITEM 37
002022  042620  066262  070772                .WORD   EM37,DH37,DT37,DF37
002030  070125
                                        ;ITEM 40
002032  042643  066262  070772                .WORD   EM40,DH40,DT40,DF40
002040  070125
                                        ;ITEM 41
002042  042675  066262  070772                .WORD   EM41,DH41,DT41,DF41
002050  070125
                                        ;ITEM 42
002052  042750  066262  070772                .WORD   EM42,DH42,DT42,DF42
002060  070125
```

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                                        ;ITEM 43
002062  043101  066262  070772                .WORD   EM43,DH43,DT43,DF43
002070  070125
                                        ;ITEM 44
002072  043232  066262  070772                .WORD   EM44,DH44,DT44,DF44
002100  070125
                                        ;ITEM 45
002102  043300  066262  070772                .WORD   EM45,DH45,DT45,DF45
002110  070125
                                        ;ITEM 46
002112  043353  066262  070772                .WORD   EM46,DH46,DT46,DF46
002120  070151
                                        ;ITEM 47
002122  043430  066262  070772                .WORD   EM47,DH47,DT47,DF47
002130  070151
                                        ;ITEM 50
002132  043564  066262  070772                .WORD   EM50,DH50,DT50,DF50
002140  070151
                                        ;ITEM 51
002142  043637  066262  070772                .WORD   EM51,DH51,DT51,DF51
002150  070151
                                        ;ITEM 52
002152  043705  066262  070772                .WORD   EM52,DH52,DT52,DF52
002160  070151
                                        ;ITEM 53
002162  051535  066262  071120                .WORD   EM53,DH53,DT53,DF53
002170  070245
                                        ;ITEM 54
002172  051566  066262  071120                .WORD   EM54,DH54,DT54,DF54
002200  070245
                                        ;ITEM 55
002202  051503  066262  071120                .WORD   EM55,DH55,DT55,DF55
002210  070245
                                        ;ITEM 56
002212  051616  066262  071120                .WORD   EM56,DH56,DT56,DF56
002220  070245
                                        ;ITEM 57
002222  051707  066262  071120                .WORD   EM57,DH57,DT57,DF57
002230  070245
                                        ;ITEM 60
002232  051777  066262  071120                .WORD   EM60,DH60,DT60,DF60
002240  070245
                                        ;ITEM 61
002242  052101  066262  071120                .WORD   EM61,DH61,DT61,DF61
002250  070245
                                        ;ITEM 62
002252  052275  066262  071120                .WORD   EM62,DH62,DT62,DF62
002260  070245
                                        ;ITEM 63
002262  052471  066262  071120                .WORD   EM63,DH63,DT63,DF63
002270  070245
                                        ;ITEM 64
002272  052602  066262  071120                .WORD   EM64,DH64,DT64,DF64
002300  070245
                                        ;ITEM 65
002302  052721  066262  071120                .WORD   EM65,DH65,DT65,DF65
002310  070245
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                                        ;ITEM 66
002312  053034  066262  071120                .WORD   EM66,DH66,DT66,DF66
002320  070245
                                        ;ITEM 67
002322  053103  066262  071120                .WORD   EM67,DH67,DT67,DF67
002330  070245
                                        ;ITEM 70
002332  053166  066262  071120                .WORD   EM70,DH70,DT70,DF70
002340  070277
                                        ;ITEM 71
002342  053217  066262  071120                .WORD   EM71,DH71,DT71,DF71
002350  070277
                                        ;ITEM 72
002352  053247  066262  071120                .WORD   EM72,DH72,DT72,DF72
002360  070277
                                        ;ITEM 73
002362  053247  066262  071120                .WORD   EM73,DH73,DT73,DF73
002370  070277
                                        ;ITEM 74
002372  053301  066262  071120                .WORD   EM74,DH74,DT74,DF74
002400  070277
                                        ;ITEM 75
002402  053410  066262  071120                .WORD   EM75,DH75,DT75,DF75
002410  070277
                                        ;ITEM 76
002412  053501  066262  071120                .WORD   EM76,DH76,DT76,DF76
002420  070277
                                        ;ITEM 77
002422  053571  066262  071120                .WORD   EM77,DH77,DT77,DF77
002430  070277
                                        ;ITEM 100
002432  053701  066262  071120                .WORD   EM100,DH100,DT100,DF100
002440  070277
                                        ;ITEM 101
002442  053764  066262  071120                .WORD   EM101,DH101,DT101,DF101
002450  070277
                                        ;ITEM 102
002452  054160  066262  071120                .WORD   EM102,DH102,DT102,DF102
002460  070277
                                        ;ITEM 103
002462  054354  066262  071120                .WORD   EM103,DH103,DT103,DF103
002470  070277
                                        ;ITEM 104
002472  054466  066262  071120                .WORD   EM104,DH104,DT104,DF104
002500  070277
                                        ;ITEM 105
002502  054633  066262  071120                .WORD   EM105,DH105,DT105,DF105
002510  070277
                                        ;ITEM 106
002512  054742  066262  071120                .WORD   EM106,DH106,DT106,DF106
002520  070277
                                        ;ITEM 107
002522  055051  066262  071120                .WORD   EM107,DH107,DT107,DF107
002530  070277
                                        ;ITEM 110
002532  055160  066262  071120                .WORD   EM110,DH110,DT110,DF110
002540  070277
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                                        ;ITEM 111
002542  043775  066262  070772                .WORD   EM111,DH111,DT111,DF111
002550  070125
                                        ;ITEM 112
002552  044052  066262  070772                .WORD   EM112,DH112,DT112,DF112
002560  070125
                                        ;ITEM 113
002562  044130  066262  070772                .WORD   EM113,DH113,DT113,DF113
002570  070125
                                        ;ITEM 114
002572  044206  066262  070772                .WORD   EM114,DH114,DT114,DF114
002600  070125
                                        ;ITEM 115
002602  044265  066623  071044                .WORD   EM115,DH115,DT115,DF115
002610  070175
                                        ;ITEM 116
002612  044343  066623  071044                .WORD   EM116,DH116,DT116,DF116
002620  070175
                                        ;ITEM 117
002622  044422  066623  071044                .WORD   EM117,DH117,DT117,DF117
002630  070175
                                        ;ITEM 120
002632  044560  066623  071044                .WORD   EM120,DH120,DT120,DF120
002640  070175
                                        ;ITEM 121
002642  044716  066623  071044                .WORD   EM121,DH121,DT121,DF121
002650  070175
                                        ;ITEM 122
002652  045053  066623  071044                .WORD   EM122,DH122,DT122,DF122
002660  070175
                                        ;ITEM 123
002662  045210  066262  070772                .WORD   EM123,DH123,DT123,DF123
002670  070151
                                        ;ITEM 124
002672  045266  066262  070772                .WORD   EM124,DH124,DT124,DF124
002700  070151
                                        ;ITEM 125
002702  045345  066262  070772                .WORD   EM125,DH125,DT125,DF125
002710  070151
                                        ;ITEM 126
002712  045423  066262  070772                .WORD   EM126,DH126,DT126,DF126
002720  070151
                                        ;ITEM 127
002722  045502  066623  071044                .WORD   EM127,DH127,DT127,DF127
002730  070221
                                        ;ITEM 130
002732  045560  066623  071044                .WORD   EM130,DH130,DT130,DF130
002740  070221
                                        ;ITEM 131
002742  045637  066623  071044                .WORD   EM131,DH131,DT131,DF131
002750  070221
                                        ;ITEM 132
002752  045775  066262  070772                .WORD   EM132,DH132,DT132,DF132
002760  070151
                                        ;ITEM 133
002762  046133  066623  071044                .WORD   EM133,DH133,DT133,DF133
002770  070221
```

```
                                        ;ITEM 134
002772  046271  066623  071044                .WORD   EM134,DH134,DT134,DF134
003000  070221
                                        ;ITEM 135
003002  046426  066262  070772                .WORD   EM135,DH135,DT135,DF135
003010  070151
                                        ;ITEM 136
003012  046563  066623  071044                .WORD   EM136,DH136,DT136,DF136
003020  070221
                                        ;ITEM 137
003022  046720  066623  071044                .WORD   EM137,DH137,DT137,DF137
003030  070175
                                        ;ITEM 140
003032  047006  066623  071044                .WORD   EM140,DH140,DT140,DF140
003040  070175
                                        ;ITEM 141
003042  043775  066623  071044                .WORD   EM141,DH141,DT141,DF141
003050  070175
                                        ;ITEM 142
003052  044052  066623  071044                .WORD   EM142,DH142,DT142,DF142
003060  070175
                                        ;ITEM 143
003062  047075  066623  071044                .WORD   EM143,DH143,DT143,DF143
003070  070175
                                        ;ITEM 144
003072  047153  066623  071044                .WORD   EM144,DH144,DT144,DF144
003100  070175
                                        ;ITEM 145
003102  047232  066262  070772                .WORD   EM145,DH145,DT145,DF145
003110  070125
                                        ;ITEM 146
003112  047377  066262  070772                .WORD   EM146,DH146,DT146,DF146
003120  070125
                                        ;ITEM 147
003122  047544  066262  070772                .WORD   EM147,DH147,DT147,DF147
003130  070125
                                        ;ITEM 150
003132  047710  066262  070772                .WORD   EM150,DH150,DT150,DF150
003140  070125
                                        ;ITEM 151
003142  050054  066623  071044                .WORD   EM151,DH151,DT151,DF151
003150  070221
                                        ;ITEM 152
003152  050142  066623  071044                .WORD   EM152,DH152,DT152,DF152
003160  070221
                                        ;ITEM 153
003162  045210  066623  071044                .WORD   EM153,DH153,DT153,DF153
003170  070221
                                        ;ITEM 154
003172  045266  066623  071044                .WORD   EM154,DH154,DT154,DF154
003200  070221
                                        ;ITEM 155
003202  050231  066623  071044                .WORD   EM155,DH155,DT155,DF155
003210  070221
                                        ;ITEM 156
003212  050307  066623  071044                .WORD   EM156,DH156,DT156,DF156
003220  070221
```

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                                        ;ITEM 157
003222  050366  066262  070772                .WORD   EM157,DH157,DT157,DF157
003230  070151
                                        ;ITEM 160
003232  050533  066623  071044                .WORD   EM160,DH160,DT160,DF160
003240  070221
                                        ;ITEM 161
003242  050671  066262  070772                .WORD   EM161,DH161,DT161,DF161
003250  070151
                                        ;ITEM 162
003252  051036  066262  070772                .WORD   EM162,DH162,DT162,DF162
003260  070151
                                        ;ITEM 163
003262  051202  066623  071044                .WORD   EM163,DH163,DT163,DF163
003270  070221
                                        ;ITEM 164
003272  051337  066262  070772                .WORD   EM164,DH164,DT164,DF164
003300  070151
                                        ;ITEM 165
003302  055270  066623  071206                .WORD   EM165,DH165,DT165,DF165
003310  070331
                                        ;ITEM 166
003312  055354  066623  071206                .WORD   EM166,DH166,DT166,DF166
003320  070331
                                        ;ITEM 167
003322  055437  066623  071206                .WORD   EM167,DH167,DT167,DF167
003330  070331
                                        ;ITEM 170
003332  055471  066623  071206                .WORD   EM170,DH170,DT170,DF170
003340  070331
                                        ;ITEM 171
003342  055557  066623  071206                .WORD   EM171,DH171,DT171,DF171
003350  070331
                                        ;ITEM 172
003352  055702  066623  071206                .WORD   EM172,DH172,DT172,DF172
003360  070331
                                        ;ITEM 173
003362  055767  066623  071206                .WORD   EM173,DH173,DT173,DF173
003370  070331
                                        ;ITEM 174
003372  056135  066623  071206                .WORD   EM174,DH174,DT174,DF174
003400  070331
                                        ;ITEM 175
003402  056303  066623  071206                .WORD   EM175,DH175,DT175,DF175
003410  070331
                                        ;ITEM 176
003412  056415  066623  071206                .WORD   EM176,DH176,DT176,DF176
003420  070363
                                        ;ITEM 177
003422  056501  066623  071206                .WORD   EM177,DH177,DT177,DF177
003430  070363
                                        ;ITEM 200
003432  056564  066623  071206                .WORD   EM200,DH200,DT200,DF200
003440  070363
                                        ;ITEM 201
003442  056616  066623  071206                .WORD   EM201,DH201,DT201,DF201
003450  070363
```

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                                        ;ITEM 202
003452  056705  066623  071206                .WORD   EM202,DH202,DT202,DF202
003460  070363
                                        ;ITEM 203
003462  057047  066623  071206                .WORD   EM203,DH203,DT203,DF203
003470  070363
                                        ;ITEM 204
003472  057211  066623  071206                .WORD   EM204,DH204,DT204,DF204
003500  070363
                                        ;ITEM 205
003502  057277  066623  071206                .WORD   EM205,DH205,DT205,DF205
003510  070363
                                        ;ITEM 206
003512  057445  066623  071206                .WORD   EM206,DH206,DT206,DF206
003520  070363
                                        ;ITEM 207
003522  057613  066762  071316                .WORD   EM207,DH207,DT207,DF207
003530  070425
                                        ;ITEM 210
003532  057655  067052  071274                .WORD   EM210,DH210,DT210,DF210
003540  070415
                                        ;ITEM 211
003542  057717  067052  071316                .WORD   EM211,DH211,DT211,DF211
003550  070425
                                        ;ITEM 212
003552  060063  066762  071370                .WORD   EM212,DH212,DT212,DF212
003560  070451
                                        ;ITEM 213
003562  060247  066762  071370                .WORD   EM213,DH213,DT213,DF213
003570  070451
                                        ;ITEM 214
003572  060433  066762  071370                .WORD   EM214,DH214,DT214,DF214
003600  070451
                                        ;ITEM 215
003602  060617  066762  071370                .WORD   EM215,DH215,DT215,DF215
003610  070451
                                        ;ITEM 216
003612  061003  067052  071316                .WORD   EM216,DH216,DT216,DF216
003620  070425
                                        ;ITEM 217
003622  061165  067113  071452                .WORD   EM217,DH217,DT217,DF217
003630  070501
                                        ;ITFM 220
003632  061227  066722  071316                .WORD   EM220,DH220,DT220,DF220
003640  070425
                                        ;ITEM 221
003642  061457  067052  071316                .WORD   EM221,DH221,DT221,DF221
003650  070425
                                        ;ITEM 222
003652  061723  066722  071316                .WORD   EM222,DH222,DT222,DF222
003660  070425
                                        ;ITEM 223
003662  062154  067052  071316                .WORD   EM223,DH223,DT223,DF223
003670  070425
                                        ;ITEM 224
003672  062421  066722  071316                .WORD   EM224,DH224,DT224,DF224
003700  070425
```

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                                        ;ITEM 225
003702  062652  067052  071316                .WORD   EM225,DH225,DT225,DF225
003710  070425
                                        ;ITEM 226
003712  063117  067166  071370                .WORD   EM226,DH226,DT226,DF226
003720  070451
                                        ;ITEM 227
003722  063252  067255  071370                .WORD   EM227,DH227,DT227,DF227
003730  070451
                                        ;ITEM 230
003732  063405  067166  071370                .WORD   EM230,DH230,DT230,DF230
003740  070451
                                        ;ITEM 231
003742  063541  067255  071274                .WORD   EM231,DH231,DT231,DF231
003750  070451
                                        ;ITEM 232
003752  057655  067255  071316                .WORD   EM232,DH232,DT232,DF232
003760  070451
                                        ;ITEM 233
003762  063675  067344  071472                .WORD   EM233,DH233,DT233,DF233
003770  070510
                                        ;ITEM 234
003772  063734  067405  071526                .WORD   EM234,DH234,DT234,DF234
004000  070525
                                        ;ITEM 235
004002  064020  067473  071546                .WORD   EM235,DH235,DT235,DF235
004010  070534
                                        ;ITEM 236
004012  064066  067533  071526                .WORD   EM236,DH236,DT236,DF236
004020  070525
                                        ;ITEM 237
004022  064121  067405  071526                .WOPD   EM237,DH237,DT237,DF237
004030  070525
                                        ;ITEM 240
004032  064205  067621  071526                .WORD   EM240,DH240,DT240,DF240
004040  070525
                                        ;ITEM 241
004042  064241  067344  071472                .WORD   EM241,DH241,DT241,DF241
004050  070510
                                        ;ITEM 242
004052  064344  067621  071526                .WORD   EM242,DH242,DT242,DF242
004060  070525
                                        ;ITEM 243
004062  064400  067344  071472                .WORD   EM243,DH243,DT243,DF243
004070  070510
                                        ;ITEM 244
004072  064503  067344  071472                .WORD   EM244,DH244,DT244,DF244
004100  070510
                                        ;ITEM 245
004102  064542  067344  071472                .WORD   EM245,DH245,DT245,DF245
004110  070510
                                        ;ITEM 246
004112  043405  066262  070772                .WORD   EM246,DH246,DT246,DF246
004120  070151
                                        ;ITEM 247
004122  064624  067711  071560                .WORD   EM247,DH247,DT247,DF247
004130  070540
```

```
                                        ;ITEM 250
004132  064660  067756  071576                .WORD   EM250,DH250,DT250,DF250
004140  070540
                                        ;ITEM 251
004142  064712  067756  071576                .WORD   EM251,DH251,DT251,DF251
004150  070540
                                        ;ITEM 252
004152  064745  066352  071610                .WORD   EM252,DH252,DT252,DF252
004160  070546
                                        ;ITEM 253
004162  065036  066262  071622                .WORD   EM253,DH253,DT253,DF253
004170  070552
                                        ;ITEM 254
004172  065122  066262  071622                .WORD   EM254,DH254,DT254,DF254
004200  070552
                                        ;ITEM 255
004202  065207  066262  071622                .WORD   EM255,DH255,DT255,DF255
004210  070552
                                        ;ITEM 256
004212  065275  066262  071622                .WORD   EM256,DH256,DT256,DF256
004220  070552
                                        ;ITEM 257
004222  065364  066262  071622                .WORD   EM257,DH257,DT257,DF257
004230  070552
                                        ;ITEM 260
004232  065452  066262  071622                .WORD   EM260,DH260,DT260,DF260
004240  070552
                                        ;ITEM 261
004242  065541  066262  071622                .WORD   EM261,DH261,DT261,DF261
004250  070552
                                        ;ITEM 262
004252  065631  066262  071622                .WORD   EM262,DH262,DT262,DF262
004260  070552
                                        ;ITEM 263
004262  065722  066262  071622                .WORD   EM263,DH263,DT263,DF263
004270  070552
                                        ;ITEM 264
004272  066007  066262  071622                .WORD   EM264,DH264,DT264,DF264
004300  070552
                                        ;ITEM 265
004302  066074  066262  071622                .WORD   EM265,DH265,DT265,DF265
004310  070552
                                        ;ITEM 266
004312  066161  070016  071610                .WORD   EM266,DH266,DT266,DF266
004320  070546
897
898
899                                     .SBTTL  ACT11 HOOKS
                                        ;;******************************************************************
                                        ;HOOKS REQUIRED BY ACT11
        004322                                  $SVPC=.                 ;SAVE PC
        000046                                  .=46
000046  033356                                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
        000052                                  .=52
000052  000000                                  .WORD   0               ;;2)SET LOC.52 TO ZERO
        004322                                  . $SVPC                 ;; RESTORE PC
900                                     .SBTTL  APT PARAMETER BLOCK
```

```
                                ;;*****************************************************************
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;*****************************************************************
                 004322                 .$X=.    ;;SAVE CURRENT LOCATION
                 000024                 .=24     ;;SET POWER FAIL TO POINT TO START OF PROGRAM
          000024 000200                 200      ;;FOR APT START UP
                 000044                 .=44     ;;POINT TO APT INDIRECT ADDRESS PNTR.
          000044 004322                 $APTHDR  ;;POINT TO APT HEADER BLOCK
                 004322                 .=.$X    ;;RESET LOCATION COUNTER
                                ;;*****************************************************************
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                ;INTERFACE SPEC.
          004322                $APTHD:
          004322 000000         $HIBTS: .WORD   0        ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
          004324 001316         $MBADR: .WORD   $MAIL    ;;ADDRESS OF APT MAILBOX (BITS 0-15)
          004326 000010         $TSTM:  .WORD   10       ;;RUN TIM OF LONGEST TEST
          004330 000040         $PASTM: .WORD   40       ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
          004332 000000         $UNITM: .WORD   0        ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
          004334 000052                 .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
     901
     902
     903 004336                 START:
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
          004336 012706 001100          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
          004342 005026                 CLR     (R6)+           ;;CLEAR MEMORY LOCATION
          004344 022706 001140          CMP     #SWR,R6 ;;DONE?
          004350 001374                 BNE     .-6             ;;LOOP BACK IF NO
          004352 012706 001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
          004356 012737 033436 000020   MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
          004364 012737 000340 000022   MOV     #340,@#IOTVEC+2 ;;LEVEL 7
          004372 012737 033716 000030   MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
          004400 012737 000340 000032   MOV     #340,@#EMTVEC+2 ;;LEVEL 7
          004406 012737 035734 000034   MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
          004414 012737 000340 000036   MOV     #340,@#TRAPVEC+2;LEVEL 7
          004422 012737 036020 000024   MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
          004430 012737 000340 000026   MOV     #340,@#PWRVEC+2 ;;LEVEL 7
          004436 016767 026536 026526   MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
          004444 005067 174632          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
          004450 005067 174630          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
          004454 112767 000001 174433   MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
                                ;;INITIALIZE THE "T-BIT" TRAP VECTOR. THEN LOAD LOCATION "$RTRN", IN
                                ;;THE "END-OF-PASS" ($EOP) ROUTINE, WITH A "RTI" OR "RTT".
          004462 012737 033422 000014   MOV     #$RTRN,@#TBITVEC ;;SET "T" BIT VECTOR TO $RTRN
          004470 012737 000340 000016   MOV     #340,@#TBITVEC+2 ;;LEVEL 7
          004476 012767 000002 026716   MOV     #RTI,$RTRN      ;;SET $RTRN TO A RTI
          004504 012737 004532 000010   MOV     #65$,@#RESVEC   ;;TRY TO DO A RTT
          004512 005046                 CLR     -(SP)           ;;DUMMY PS
          004514 012746 004522          MOV     #64$,-(SP)      ;;AND PC
          004520 000006                 RTT                     ;;TRY THE RTT
          004522 012767 000006 026672 64$:      MOV     #RTT,$RTRN      ;;RTT IS LEGAL--SET $RTRN TO A RTT
          004530 000402                 BR      66$
          004532 062706 000010  65$:    ADD     #10,SP          ;;RTT ILLEGAL--CLEAN OFF THE STACK
          004536 012737 000012 000010 66$:      MOV     #RESVEC+2,@#RESVEC ;;RESTORE TRAP CATCHER
          004544 005067 026660          CLR     $TBIT           ;;CLEAR "T" BIT SWITCH
          004550 012767 004550 174330   MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
```

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004556  012767  004556  174324          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
004564  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
004570  012737  004624  000004  MOV     #67$,@#ERRVEC   ;;SET UP ERROR VECTOR
004576  012767  177570  174334  MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
004604  012767  177570  174330  MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
004612  022777  177777  174320  CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
004620  001012                  BNE     69$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
004622  000403                  BR      68$             ;;BRANCH IF NO TIMEOUT
004624  012716  004632  67$:    MOV     #68$,(SP)       ;;SET UP FOR TRAP RETURN
004630  000002                  RTI
004632  012767  000176  174300 68$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
004640  012767  000174  174274          MOV     #DISPREG,DISPLAY
004646  012637  000004  69$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
004652  005067  174446          CLR     $PASS           ;;CLEAR PASS COUNT
004656  132767  000200  174453  BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
004664  001403                  BEQ     70$             ;;YES,USE NON-APT SWITCH
004666  012767  001340  174244  MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
004674                  70$:
904                             .SBTTL  TYPE PROGRAM NAME
                                ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
004674  005227  177777          INC     #-1             ;;FIRST TIME?
004700  001047                  BNE     71$             ;;BRANCH IF NO
004702  022737  033356  000042  CMP     #$ENDAD,@#42    ;;ACT-11?
004710  001443                  BEQ     71$             ;;BRANCH IF YES
004712  104401  004760          TYPE    ,72$            ;;TYPE ASCIZ STRING
                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
004716  005737  000042          TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
004722  001012                  BNE     73$             ;;BRANCH IF YES
004724  126727  174406  000001  CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
004732  001406                  BEQ     73$             ;;BRANCH IF YES
004734  026727  174200  000176  CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
004742  001005                  BNE     74$             ;;BRANCH IF NO
004744  104405                  GTSWR                   ;;GET SOFT-SWR SETTINGS
004746  000403                  BR      74$
004750  112767  000001  174156 73$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
004756                  74$:
004756  000420                  BR      71$             ;;GET OVER THE ASCIZ
                                ;;72$:  .ASCIZ  <CRLF>*CKFPBA0 FP11F FLTG PNT PRT B*<CRLF>
005020                  71$:
905
906 005020                      LOOP:
907
908
919                             ;;******************************************************************
                                ;*TEST 1         ROUND\TRUNK TEST
                                ;*
                                ;* THIS IS A TEST OF THE ROUND\TRUNK
                                ;* FLOWS.  IN PARTICULAR TWO THINGS ARE TESTED:
                                ;* FIRST A CONDITION IN WHICH ROUNDING
                                ;* RESULTS IN THE NEED FOR RENORMALIZATION, AND
                                ;* SECOND  THE PSW CONDITION CODES N AND
                                ;* Z BIT COMMBINATIONS
                                ;*
                                ;;******************************************************************
```

```
        005020  000004                  TST1:   SCOPE
    920
    921                                         ;ROUND AND NORMALIZE TEST
    922
    923 005022                          HH1:
        005022  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
    924 005024  012704  003200                  MOV     #3200,R4                ;SET FIU, FIV, AND FD
    925 005030  170104                          LDFPS   R4
    926 005032  012737  005052  001236          MOV     #HH2,@#$TMP2
    927 005040  012700  006602                  MOV     #HHP0,R0                ;SET AC0 OPERAND
    928 005044  172410                          LDD     (R0),AC0
    929 005046  012700  006612                  MOV     #HHP1,R0                ;FSPC
    930 005052  172010                  HH2:    ADDD    (R0),AC0                ;TEST INSTRUCTION
    931 005054  170205                          STFPS   R5                      ;GET FPS
    932 005056  012700  006572                  MOV     #HHDAT0,R0              ;GET THE RESULT
    933 005062  174010                          STD     AC0,(R0)
    934 005064  012701  006622                  MOV     #HHP2,R1                ;IS IT CORRECT
    935 005070  012702  000004                  MOV     #4,R2
    936 005074  022021                  HH3:    CMP     (R0)+,(R1)+
    937 005076  001415                          BEQ     HH6
    938 005100  012700  006572                  MOV     #HHDAT0,R0              ;DID FLOW GO
    939 005104  012701  006632                  MOV     #HHP3,R1                ;FROM STATE 663
    940 005110  012702  000004                  MOV     #4,R2                   ;TO 313 INSTEAD
    941 005114  022021                  HH4:    CMP     (R0)+,(R1)+             ;OF TO 353
    942 005116  001402                          BEQ     HH5
    943 005120  000137  005612                  JMP @#HHER0
    944 005124  077205                  HH5:    SOB     R2,HH4
    945 005126  000137  005660                  JMP     @#HHER1
    946 005132  077220                  HH6:    SOB     R2,HH3
    947 005134  020405                          CMP     R4,R5           ;FPS CORRECT?
    948 005136  001402                          BEQ     HH7
    949 005140  000137  005726                  JMP     @#HHER00
    950
    951                                 ;THIS IS A TEST OF THE ABILITY
    952                                 ;OF NORMALIZE TO PRODUCE A ZERO EXP. AND
    953                                 ;OF THE R\T ALGORITHM TO PORPERLY SET THE FPS
    954
    955 005144                          HH7:
        005144  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
    956 005146  012704  043200                  MOV     #043200,R4              ;SET FIU,FIV,AND FD
    957                                                                         ;FID
    958 005152  170104                          LDFPS   R4
    959 005154  012737  005202  001236          MOV     #HH8,@#$TMP2            ;IN CASE UNDERFLOW
    960 005162  012737  006522  000244          MOV     #HHTRAP,@#FPVECT        ;TRAP OCCURS
    961 005170  012700  006652                  MOV     #HHP5,R0                ;SET AC0 OPERAND
    962 005174  172410                          LDD     (R0),AC0
    963 005176  012700  006662                  MOV     #HHP6,R0                ;FSPC
    964 005202  172010                  HH8:    ADDD    (R0),AC0                ;TEST INSTRUCTION
    965 005204  170205                          STFPS   R5                      ;GET FPS
    966 005206  012700  006572                  MOV     #HHDAT0,R0              ;GET THE RESULT
    967 005212  174010                          STD     AC0,(R0)
    968 005214  012701  006642                  MOV     #HHP4,R1                ;IS IT CORRECT
    969 005220  012702  000004                  MOV     #4,R2
    970 005224  022021                  HH9:    CMP     (R0)+,(R1)+
    971 005226  001402                          BEQ     HH10
    972 005230  000137  005774                  JMP     @#HHER2
    973 005234  077205                  HH10:   SOB     R2,HH9
```

```
;;      ROUND\TRUNK TEST

     974 005236  052704  100004                 BIS     #100004,R4              ;FPS CORRECT?
     975 005242  020405                         CMP     R4,R5
     976 005244  001402                         BEQ     HH11
     977 005246  000137  006042                 JMP     @#HHER3
     978                             ;THIS IS A TEST OF THE R\T ALGORITHM'S
     979                             ;ABILITY TO SET BOTH N AND Z ON A - 0 RESULT.
     980 005252                      HH11:
         005252  104413                         LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
     981                                                                         ;SET FIV, FIV, AND FD
     982 005254  012704  043200                 MOV     #043200,R4
     983 005260  170104                         LDFPS   R4
     984 005262  012737  005302  001236         MOV     #HH12,@#$TMP2
     985 005270  012700  006702                 MOV     #HHP8,R0                ;SET AC0 OPERAND
     986 005274  172410                         LDD     (R0),AC0
     987 005276  012700  006712                 MOV     #HHP9,R0                ;FSPC
     988 005302  172010                 HH12:   ADDD    (R0),AC0                ;TEST INSTRUCTION
     989 005304  170205                         STFPS   R5                      ;GET FPS
     990 005306  012700  006572                 MOV     #HHDAT0,R0              ;GET THE RESULT
     991 005312  174010                         STD     AC0,(R0)
     992 005314  012701  006672                 MOV     #HHP7,R1                ;IS IT CORRECT
     993 005320  012702  000004                 MOV     #4,R2
     994 005324  022021                 HH13:   CMP     (R0)+,(R1)+
     995 005326  001415                         BEQ     HH16
     996 005330  012700  006572                 MOV     #HHDAT0,R0
     997 005334  012701  006642                 MOV     #HHP4,R1
     998 005340  012702  000004                 MOV     #4,R2
     999 005344  022021                 HH14:   CMP     (R0)+,(R1)+
    1000 005346  001402                         BEQ     HH15
    1001 005350  000137  006110                 JMP     @#HHER4
    1002 005354  077205                 HH15:   SOB     R2,HH14
    1003 005356  000137  006156                 JMP     @#HHER5
    1004 005362  077220                 HH16:   SOB     R2,HH13
    1005 005364  052704  100014                 BIS     #100014,R4              ;FPS CORRECT?
    1006 005370  020405                         CMP     R4,R5
    1007 005372  001402                         BEQ     HH17
    1008 005374  000137  006224                 JMP     @#HHER6
    1009                             ;TEST THAT CC ARE CLEARED BY R\T
    1010 005400                      HH17:
         005400  104413                         LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
    1011 005402  012704  000200                 MOV     #00200,R4               ;SET FIV, FIV, AND FD
    1012 005406  170104                         LDFPS   R4
    1013 005410  012737  005436  001236         MOV     #HH18,@#$TMP2
    1014 005416  012737  036660  000244         MOV     #FPSPUR,@#FPVECT
    1015 005424  012700  006702                 MOV     #HHP8,R0                ;SET AC0 OPERAND
    1016 005430  172410                         LDD     (R0),AC0
    1017 005432  012700  006702                 MOV     #HHP8,R0                ;FSPC
    1018 005436  172010                 HH18:   ADDD    (R0),AC0                ;TEST INSTRUCTION
    1019 005440  170205                         STFPS   R5                      ;GET FPS
    1020 005442  012700  006572                 MOV     #HHDAT0,R0              ;GET THE RESULT
    1021 005446  174010                         STD     AC0,(R0)
    1022 005450  012701  006722                 MOV     #HHP10,R1               ,IS IT CORRECT
    1023 005454  012702  000004                 MOV     #4,R2
    1024 005460  022021                 HH19:   CMP     (R0)+,(R1)+
    1025 005462  001402                         BEQ     HH20
    1026 005464  000137  006272                 JMP @#HHER7
    1027 005470  077205                 HH20:   SOB     R2,HH19
    1028 005472  052704  000000                 BIS     #00000,R4               ;FPS CORRECT?
```

```
1029 005476  020405                        CMP     R4,R5
1030 005500  001402                        BEQ     HH21
1031 005502  000137  006340                JMP     @#HHER8
1032                              ;TEST THAT N IS SET BY R\T
1033 005506                       HH21:
     005506  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1034 005510  012704  003200                MOV     #3200,R4                ;SET FIV, FIV, AND FD
1035 005514  170104                        LDFPS   R4
1036 005516  012737  005536  001236        MOV     #HH22,@#$TMP2
1037 005524  012700  006652                MOV     #HHP5,R0                ;SET AC0 OPERAND
1038 005530  172410                        LDD     (R0),AC0
1039 005532  012700  006652                MOV     #HHP5,R0                ;FSPC
1040 005536  172010               HH22:    ADDD    (R0),AC0                ;TEST INSTRUCTION
1041 005540  170205                        STFPS   R5                      ;GET FPS
1042 005542  012700  006572                MOV     #HHDAT0,R0              ;GET THE RESULT
1043 005546  174010                        STD     AC0,(R0)
1044 005550  012701  006732                MOV     #HHP11,R1               ;IS IT CORRECT
1045 005554  012702  000004                MOV     #4,R2
1046 005560  022021               HH23:    CMP     (R0)+,(R1)+
1047 005562  001402                        BEQ     HH24
1048 005564  000137  006406                JMP     @#HHER9
1049 005570  077205               HH24:    SOB     R2,HH23
1050 005572  052704  000010                BIS     #10,R4
1051 005576  020405                        CMP     R4,R5                   ;FPS CORRECT?
1052 005600  001402                        BEQ     HH25
1053 005602  000137  006454                JMP     @#HHER10
1054 005606  000137  006742          HH25: JMP     @#HHDONE
1055 005612                       HHER0:
     005612  010537  001252                MOV     R5,@#$TMP10
     005616  010437  001254                MOV     R4,@#$TMP11
     005622  012737  006612  001240        MOV     #HHP1,@#$TMP3
     005630  012737  006602  001242        MOV     #HHP0,@#$TMP4
     005636  012737  006572  001244        MOV     #HHDAT0,@#$TMP5
     005644  012737  006622  001246        MOV     #HHP2,@#$TMP6
     005652  104207                1$:     ERROR   +207
     005654  000137  006742                JMP     @#HHDONE
1056 005660                       HHER1:
     005660  010537  001252                MOV     R5,@#$TMP10
     005664  010437  001254                MOV     R4,@#$TMP11
     005670  012737  006612  001240        MOV     #HHP1,@#$TMP3
     005676  012737  006602  001242        MOV     #HHP0,@#$TMP4
     005704  012737  006572  001244        MOV     #HHDAT0,@#$TMP5
     005712  012737  006622  001246        MOV     #HHP2,@#$TMP6
     005720  104211                1$:     ERROR   +211
     005722  000137  006742                JMP     @#HHDONE
1057 005726                       HHER00:
     005726  010537  001252                MOV     R5,@#$TMP10
     005732  010437  001254                MOV     R4,@#$TMP11
     005736  012737  006612  001240        MOV     #HHP1,@#$TMP3
     005744  012737  006602  001242        MOV     #HHP0,@#$TMP4
     005752  012737  006572  001244        MOV     #HHDAT0,@#$TMP5
     005760  012737  006622  001246        MOV     #HHP2,@#$TMP6
     005766  104210                1$:     ERROR   +210
     005770  000137  006742                JMP     @#HHDONE
1058 005774                       HHER2:
     005774  010537  001252                MOV     R5,@#$TMP10
     006000  010437  001254                MOV     R4,@#$TMP11
```

```
        006004  012737  006662  001240          MOV     #HHP6,@#$TMP3
        006012  012737  006652  001242          MOV     #HHP5,@#$TMP4
        006020  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006026  012737  006642  001246          MOV     #HHP4,@#$TMP6
        006034  104207                  1$:     ERROR   +207
        006036  000137  006742                  JMP     @#HHDONE
   1059 006042                          HHER3:
        006042  010537  001252                  MOV     R5,@#$TMP10
        006046  010437  001254                  MOV     R4,@#$TMP11
        006052  012737  006662  001240          MOV     #HHP6,@#$TMP3
        006060  012737  006652  001242          MOV     #HHP5,@#$TMP4
        006066  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006074  012737  006642  001246          MOV     #HHP4,@#$TMP6
        006102  104214                  1$:     ERROR   +214
        006104  000137  006742                  JMP     @#HHDONE
   1060 006110                          HHER4:
        006110  010537  001252                  MOV     R5,@#$TMP10
        006114  010437  001254                  MOV     R4,@#$TMP11
        006120  012737  006712  001240          MOV     #HHP9,@#$TMP3
        006126  012737  006702  001242          MOV     #HHP8,@#$TMP4
        006134  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006142  012737  006672  001246          MOV     #HHP7,@#$TMP6
        006150  104207                  1$:     ERROR   +207
        006152  000137  006742                  JMP     @#HHDONE
   1061 006156                          HHER5:
        006156  010537  001252                  MOV     R5,@#$TMP10
        006162  010437  001254                  MOV     R4,@#$TMP11
        006166  012737  006712  001240          MOV     #HHP9,@#$TMP3
        006174  012737  006702  001242          MOV     #HHP8,@#$TMP4
        006202  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006210  012737  006672  001246          MOV     #HHP7,@#$TMP6
        006216  104216                  1$:     ERROR   +216
        006220  000137  006742                  JMP     @#HHDONE
   1062 006224                          HHER6:
        006224  010537  001252                  MOV     R5,@#$TMP10
        006230  010437  001254                  MOV     R4,@#$TMP11
        006234  012737  006712  001240          MOV     #HHP9,@#$TMP3
        006242  012737  006702  001242          MOV     #HHP8,@#$TMP4
        006250  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006256  012737  006672  001246          MOV     #HHP7,@#$TMP6
        006264  104215                  1$:     ERROR   +215
        006266  000137  006742                  JMP     @#HHDONE
   1063 006272                          HHER7:
        006272  010537  001252                  MOV     R5,@#$TMP10
        006276  010437  001254                  MOV     R4,@#$TMP11
        006302  012737  006702  001240          MOV     #HHP8,@#$TMP3
        006310  012737  006702  001242          MOV     #HHP8,@#$TMP4
        006316  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
        006324  012737  006722  001246          MOV     #HHP10,@#$TMP6
        006332  104207                  1$:     ERROR   +207
        006334  000137  006742                  JMP     @#HHDONE
   1064 006340                          HHER8:
        006340  010537  001252                  MOV     R5,@#$TMP10
        006344  010437  001254                  MOV     R4,@#$TMP11
        006350  012737  006702  001240          MOV     #HHP8,@#$TMP3
        006356  012737  006702  001242          MOV     #HHP8,@#$TMP4
        006364  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
```

```
                006372  012737  006722  001246          MOV     #HHP10,@#$TMP6
                006400  104212                  1$:     ERROR   +212
                006402  000137  006742                  JMP     @#HHDONE
          1065  006406                          HHER9:
                006406  010537  001252                  MOV     R5,@#$TMP10
                006412  010437  001254                  MOV     R4,@#$TMP11
                006416  012737  006652  001240          MOV     #HHP5,@#$TMP3
                006424  012737  006652  001242          MOV     #HHP5,@#$TMP4
                006432  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
                006440  012737  006732  001246          MOV     #HHP11,@#$TMP6
                006446  104207                  1$:     ERROR   +207
                006450  000137  006742                  JMP     @#HHDONE
          1066  006454                          HHER'0:
                006454  010537  001252                  MOV     R5,@#$TMP10
                006460  010437  001254                  MOV     R4,@#$TMP11
                006464  012737  006652  001240          MOV     #HHP5,@#$TMP3
                006472  012737  006652  001242          MOV     #HHP5,@#$TMP4
                006500  012737  006572  001244          MOV     #HHDAT0,@#$TMP5
                006506  012737  006732  001246          MOV     #HHP11,@#$TMP6
                006514  104213                  1$:     ERROR   +213
                006516  000137  006742                  JMP     @#HHDONE
          1067  006522  013703  001236          HHTRAP: MOV     @#$TMP2,R3      ;WAS THE TRAP TO 244
          1068  006526  062703  000002                  ADD     #2,R3           ;ON THE INSTRUCTION
          1069  006532  020316                          CMP     R3,(SP)         ;BEING TESTED?
          1070  006534  001402                          BEQ     1$
          1071  006536  000137  036660                  JMP     @#FPSPUR
          1072  006542  011637  001236          1$:     MOV     (SP),@#$TMP2    ;FAILURE OF FPS INTERRUPT
          1073                                                                  ;DISABLE BIT (FID-1)
          1074  006546  022626                          CMP     (SP)+,(SP)+     ;TO INHIBIT TRAP.
          1075  006550  170201                          STFPS   R1
          1076  006552  010137  001240                  MOV     R1,@#$TMP3
          1077  006556  170301                          STST    R1
          1078  006560  010137  001242                  MOV     R1,@#$TMP4
          1079  006564  104217                  2$:     ERROR   +217
          1080  006566  000137  006742                  JMP     @#HHDONE
          1081  006572  000000                  HHDAT0: 0
          1082  006574  000000                          0
          1083  006576  000000                          0
          1084  006600  000000                          0
          1085  006602  000452                  HHP0:   452
          1086  006604  125252                          125252
          1087  006606  125252                          125252
          1088  006610  125253                          125253
          1089  006612  000252                  HHP1:   252
          1090  006614  125252                          125252
          1091  006616  125252                          125252
          1092  006620  125252                          125252
          1093  006622  000600                  HHP2:   600                     ;HHP0 + HHP1 WITH
          1094  006624  000000                          0                       ;PROPER NORMALIZATION
          1095  006626  000000                          0
          1096  006630  000000                          0
          1097  006632  000400                  HHP3:   400                     ;HHP0 + HHP1 WITH
          1098  006634  000000                          0                       ;BAD NORMALIZATION
          1099  006636  000000                          0
          1100  006640  000000                          0
          1101  006642  000000                  HHP4:   0
          1102  006644  000000                          0
```

```
1103 006646  000000                        0
1104 006650  000000                        0
1105 006652  100200              HHP5:     100200
1106 006654  000000                        0
1107 006656  000000                        0
1108 006660  000000                        0
1109 006662  000300              HHP6:     300
1110 006664  000000                        0
1111 006666  000000                        0
1112 006670  000000                        0
1113 006672  100000              HHP7:     100000              ;HHP7   HHP8 + HHP9
1114 006674  000000                        0                   ;        HHP5 + HHP6
1115 006676  000000                        0
1116 006700  000000                        0
1117 006702  000200              HHP8:     200
1118 006704  000000                        0
1119 006706  000000                        0
1120 006710  000000                        0
1121 006712  100300              HHP9:     100300
1122 006714  000000                        0
1123 006716  000000                        0
1124 006720  000000                        0
1125 006722  000400              HHP10:    400                 ;HHP10   HHP8 + HHP8
1126 006724  000000                        0
1127 006726  000000                        0
1128 006730  000000                        0
1129 006732  100400              HHP11:    100400              ;HHP11 - HHP5 + HHP5
1130 006734  000000                        0
1131 006736  000000                        0
1132 006740  000000                        0
1133 006742                      HHDONE:
     006742  104412                        RSETUP              ;GO INITIALIZE THE FPS AND STACK; AND
                                             ;SEE IF THE USER HAS EXPRESSED
                                             ;THE DESIRE TO CHANGE THE SOFTWARE
                                             ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                             ;THE USER TYPED CONTROL G?).
1134
1148
1149                                 ;*****************************************************************
                                     ;*TEST 2        OVER\UNDER TEST
                                     ;*
                                     ;*THIS IS A PARTIAL TEST OF THE OVER\UNDER
                                     ;*FLOWS.  ONE OVERFLOW AND TWO UNDERFLOW
                                     ;*CONDITIONS ARE CHECKED.  THE REMAINING
                                     ;*UNDERFLOW COND. AND THE REMAINING OVERFLOW
                                     ;*COND. WILL BE CHECKED LATER USING THE
                                     ;*XXX INSTRUCTION.  HERE EACH CONDITION TESTED
                                     ;*IS CHECKED BOTH WITH TRAPS ENABLED
                                     ;*(FIU=1 OR FIV 1) AND ALSO WITH TRAPS
                                     ;*DISABLED (FIU=0 OR FIV=0).
                                     ;*
                                     ;*****************************************************************
     006744  000004                  TST2:   SCOPE
1150
1151                                 ;TEST OVERFLOW CONDITION WITH TRAP DISABLER FIV=0
1152 006746                          GG1:
     006746  104413                        LPERR               ;SET UP THE LOOP ON ERROR ADDRESS.
```

```
1153 006750  012704  000200                    MOV     #200,R4          ;CLEAR FIU, FIV, AND SET FD
1154 006754  170104                            LDFPS   R4
1155 006756  012737  007004  001236            MOV     #GG2,@#$TMP2
1156 006764  012737  010036  000244            MOV     #GGER0,@#FPVECT
1157 006772  012700  011610                    MOV     #GGP5,R0         ;SET AC0 OPERAND
1158 006776  172410                            LDD     (R0),AC0
1159 007000  012700  011610                    MOV     #GGP5,R0         ;FSRC
1160 007004  172010                  GG2:      ADDD    (R0),AC0         ;TEST INSTRUCTION
1161 007006  170205                            STFPS   R5               ;GET FPS
1162 007010  012700  011540                    MOV     #GGDAT0,R0       ;GET THE RESULT
1163 007014  174010                            STD     AC0,(R0)
1164 007016  012701  011620                    MOV     #GGP6,R1         ;IS IT CORRECT
1165 007022  012702  000004                    MOV     #4,R2
1166 007026  022021                  GG3:      CMP     (R0)+,(R1)+
1167 007030  001402                            BEQ     GG4
1168 007032  000137  010134                    JMP     @#GGER1
1169 007036  077205                  GG4:      SOB     R2,GG3
1170 007040  052704  000006                    BIS     #6,R4            ;FPS CORRECT?
1171 007044  020405                            CMP     R4,R5
1172 007046  001402                            BEQ     GG5
1173 007050  000137  010202                    JMP     @#GGER2
1174                                           ;TEST OVERFLOW WITH TRAPS ENABLED
1175                                           ;FIV = 1
1176 007054                        GG5:
     007054  104413                            LPERR                    ;SET UP THE LOOP ON ERROR ADDRESS.
1177 007056  012704  001200                    MOV     #1200,R4         ;CLEAR FIU, SET FIV, AND FD
1178 007062  170104                            LDFPS   R4
1179 007064  012737  007112  001236            MOV     #GG6,@#$TMP2
1180 007072  012737  007130  000244            MOV     #GG7,@#FPVECT
1181 007100  012700  011610                    MOV     #GGP5,R0         ;SET AC0 OPERAND
1182 007104  172410                            LDD     (R0),AC0
1183 007106  012700  011610                    MOV     #GGP5,R0         ;FSRC
1184 007112  172010                  GG6:      ADDD    (R0),AC0         ;TEST INSTRUCTION
1185 007114  170000                            CFCC
1186 007116  012700  011540                    MOV     #GGDAT0,R0
1187 007122  174010                            STD     AC0,(R0)
1188 007124  000137  010250                    JMP     @#GGER3
1189 007130  013703  001236          GG7:      MOV     @#$TMP2,R3
1190 007134  062703  000002                    ADD     #2,R3
1191 007140  020316                            CMP     R3,(SP)
1192 007142  001402                            BEQ     1$
1193 007144  000137  036660                    JMP     @#FPSPUR
1194 007150  011637  001236          1$:       MOV     (SP),@#$TMP2
1195 007154  022626                            CMP     (SP)+,(SP)+
1196 007156  170205                            STFPS   R5
1197 007160  012700  011540                    MOV     #GGDAT0,R0       ;GET THE RESULT
1198 007164  174010                            STD     AC0,(R0)
1199 007166  012701  011620                    MOV     #GGP6,R1         ;IS IT CORRECT
1200 007172  012702  000004                    MOV     #4,R2
1201 007176  022021                  GG8:      CMP     (R0)+,(R1)+
1202 007200  001402                            BEQ     GG9
1203 007202  000137  010316                    JMP     @#GGER4
1204 007206  077205                  GG9:      SOB     R2,GG8
1205 007210  052704  100006                    BIS     #100006,R4
1206 007214  020405                            CMP     R4,R5            ;FPS CORRECT?
1207 007216  001402                            BEQ     1$
1208 007220  000137  010366                    JMP     @#GGER6
```

```
1209 007224  012704  000010          1$:     MOV     #10,R4
1210                                 ;CHECK FEC
1211 007230  170305                          STST    R5
1212 007232  020405                          CMP     R4,R5
1213 007234  001402                          BEQ     GG10
1214 007236  000137  010320                  JMP     @#GGER5
1215                                 ;CHECK UNDER FLOW CONDITION WITH
1216                                 ;TRAPS DISABLED (FIU = 0)
1217 007242                          GG10:
     007242  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1218 007244  012704  000200                  MOV     #0200,R4        ;SET FIU, FIV, AND FD
1219 007250  170104                          LDFPS   R4
1220 007252  012737  007300  001236          MOV     #GG11,@#$TMP2
1221 007260  012737  010434  000244          MOV     #GGER7,@#FPVECT
1222 007266  012700  011560                  MOV     #GGP2,R0        ;SET AC0 OPERAND
1223 007272  172410                          LDD     (R0),AC0        ;FSRC
1224 007274  012700  011570                  MOV     #GGP3,R0
1225 007300  172010                  GG11:   ADDD    (R0),AC0        ;TEST INSTRUCTION
1226 007302  170205                          STFPS   R5              ;GET FPS
1227 007304  012700  011540                  MOV     #GGDAT0,R0      ;GET THE RESULT
1228 007310  174010                          STD     AC0,(R0)
1229 007312  012701  011620                  MOV     #GGP6,R1        ;IS IT CORRECT
1230 007316  012702  000004                  MOV     #4,R2
1231 007322  022021                  GG12:   CMP     (R0)+,(R1)+
1232 007324  001402                          BEQ     GG13
1233 007326  000137  010532                  JMP     @#GGER8
1234 007332  077205                  GG13:   SOB     R2,GG12
1235 007334  052704  000004                  BIS     #4,R4           ;FPS CORRECT?
1236 007340  020405                          CMP     R4,R5
1237 007342  001402                          BEQ     GG14
1238 007344  000137  010600                  JMP     @#GGER9
1239                                 ;CHECK UNDERFLOW CONDITION WITH
1240                                 ;TRAP ENABLED (FIU = 1)
1241 007350                          GG14:
     007350  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1242 007352  012704  002200                  MOV     #2200,R4        ;SET FIU, FIV, AND FD
1243 007356  170104                          LDFPS   R4
1244 007360  012737  007406  001236          MOV     #GG15,@#$TMP2
1245 007366  012737  007424  000244          MOV     #GG16,@#FPVECT
1246 007374  012700  011560                  MOV     #GGP2,R0        ;SET AC0 OPERAND
1247 007400  172410                          LDD     (R0),AC0        ;FSPC
1248 007402  012700  011570                  MOV     #GGP3,R0
1249 007406  172010                  GG15:   ADDD    (R0),AC0        ;TEST INSTRUCTION
1250 007410  170000                          CFCC
1251 007412  012700  011540                  MOV     #GGDAT0,R0
1252 007416  174010                          STD     AC0,(R0)
1253 007420  000137  010646                  JMP     @#GGER10
1254 007424  013703  001236          GG16:   MOV     @#$TMP2,R3
1255 007430  062703  000002                  ADD     #2,R3
1256 007434  021603                          CMP     (SP),R3
1257 007436  001402                          BEQ     1$
1258 007440  000137  036660                  JMP     @#FPSPUR
1259 007444  011637  001236          1$:     MOV     (SP),@#$TMP2
1260 007450  022626                          CMP     (SP)+,(SP)+
1261 007452  170205                          STFPS   R5              ;GET FPS
1262 007454  012700  011540                  MOV     #GGDAT0,R0      ;GET THE RESULT
1263 007460  174010                          STD     AC0,(R0)
```

```
1264 007462  012701  011630                    MOV     #GGP7,R1        ;IS IT CORRECT
1265 007466  012702  000004                    MOV     #4,R2
1266 007472  022021                    GG17:   CMP     (R0)+,(R1)+
1267 007474  001402                            BEQ     GG18
1268 007476  000137  010714                    JMP     @#GGER11
1269 007502  077205                    GG18:   SOB     R2,GG17
1270 007504  052704  100000                    BIS     #100000,R4
1271 007510  020405                            CMP     R4,R5           ;FPS CORRECT?
1272 007512  001402                            BEQ     2$
1273 007514  000137  010762                    JMP     @#GGER12
1274 007520                            2$:
1275 007520  012704  000012            1$:     MOV     #12,R4
1276                                   ;CHECK FEC
1277 007524  170305                            STST    R5
1278 007526  020405                            CMP     R4,R5
1279 007530  001402                            BEQ     GG19
1280 007532  000177  001272                    JMP     @GGER13
1281                                   ;CHECK UNDERFLOW CONDITION WITH TRAPS
1282                                   ;DISABLED (FIU = 0)
1283 007536                            GG19:
   . 007536  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1284 007540  012704  000200                    MOV     #0200,R4        ;SET FIU, FIV, AND FD
1285 007544  170104                            LDFPS   R4
1286 007546  012737  007574  001236            MOV     #GG20,@#$TMP2
1287 007554  012737  011076  000244            MOV     #GGER14,@#FPVECT
1288 007562  012700  011560                    MOV     #GGP2,R0        ;SET AC0 OPERAND
1289 007566  172410                            LDD     (R0),AC0
1290 007570  012700  011640                    MOV     #GGP8,R0        ;FSPC
1291 007574  172010                    GG20:   ADDD    (R0),AC0        ;TEST INSTRUCTION
1292 007576  170205                            STFPS   R5              ;GET FPS
1293 007600  012700  011540                    MOV     #GGDAT0,R0      ;GET THE RESULT
1294 007604  174010                            STD     AC0,(R0)
1295 007606  012701  011620                    MOV     #GGP6,R1        ;IS IT CORRECT
1296 007612  012702  000004                    MOV     #4,R2
1297 007616  022021                    GG21:   CMP     (R0)+,(R1)+
1298 007620  001402                            BEQ     GG22
1299 007622  000137  011174                    JMP     @#GGER15
1300 007626  077205                    GG22:   SOB     R2,GG21
1301 007630  052704  000004                    BIS     #4,R4           ;FPS CORRECT?
1302 007634  020405                            CMP     R4,R5
1303 007636  001402                            BEQ     GG23
1304 007640  000137  011242                    JMP     @#GGER16
```

```
1306                                    ;CHECK UNDERFLOW CONDITION WITH TRAP
```

```
1308                                            ;ENABLED (FIU = 1)
1309 007644                                GG23:
     007644  104413                             LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1310 007646  012704  002200                      MOV     #2200,R4        ;SET FIU, FIV, AND FD
1311 007652  170104                              LDFPS   R4
1312 007654  012737  007702  001236              MOV     #GG24,@#$TMP2
1313 007662  012737  007720  000244              MOV     #GG25,@#FPVECT
1314 007670  012700  011560                      MOV     #GGP2,R0        ;SET AC0 OPERAND
1315 007674  172410                              LDD     (R0),AC0
1316 007676  012700  011640                      MOV     #GGP8,R0        ;FSRC
1317 007702  172010                        GG24: ADDD    (R0),AC0        ;TEST INSTRUCTION
1318 007704  170000                              CFCC
1319 007706  012700  011540                      MOV     #GGDAT0,R0
1320 007712  174010                              STD     AC0,(R0)
1321 007714  000137  011310                      JMP     @#GGER17
1322 007720  013700  001236                GG25: MOV     @#$TMP2,R0
1323 007724  062700  000002                      ADD     #2,R0
1324 007730  020016                              CMP     R0,(SP)
1325 007732  001402                              BEQ     1$
1326 007734  000137  036660                      JMP     @#FPSPUR
1327 007740  011637  001236                1$:   MOV     (SP),@#$TMP2
1328 007744  022626                              CMP     (SP)+,(SP)+
1329 007746  170205                              STFPS   R5              ;GET FPS
1330 007750  012700  011540                      MOV     #GGDAT0,R0      ;GET THE RESULT
1331 007754  174010                              STD     AC0,(R0)
1332 007756  012701  011650                      MOV     #GGP9,R1        ;IS IT CORRECT
1333 007762  012702  000004                      MOV     #4,R2
1334 007766  022021                        GG26: CMP     (R0)+,(R1)+
1335 007770  001402                              BEQ     GG27
1336 007772  000137  011356                      JMP     @#GGER18
1337 007776  077205                        GG27: SOB     R2,GG26
1338 010000  052704  100004                      BIS     #100004,R4
1339 010004  020405                              CMP     R4,R5           ;FPS CORRECT?
1340 010006  001402                              BEQ     1$
1341 010010  000167  001456                      JMP     GGER20
1342 010014  012704  000012                1$:   MOV     #12,R4
1343                                            ;CHECK FEC
1344 010020  170305                              STST    R5
1345 010022  020405                              CMP     R4,R5
1346 010024  001402                              BEQ     GG28
1347 010026  000167  001372                      JMP     GGER19
1348
1349 010032  000137  011660                GG28: JMP     @#GGDONE
1350
1351 010036  013701  001236                GGER0: MOV    @#$TMP2,R1
1352 010042  062701  000002                      ADD     #2,R1
1353 010046  020116                              CMP     R1,(SP)
1354 010050  001402                              BEQ     10$
1355 010052  000137  036660                5$:   JMP     @#FPSPUR
1356 010056                                10$:
1357 010056  170301                              STST    R1
1358 010060  020127  000010                      CMP     R1,#10
1359 010064  001372                              BNE     5$
1360 010066  022626                              CMP     (SP)+,(SP)+
1361 010070  012700  011540                      MOV     #GGDAT0,R0
1362 010074  174010                              STD     AC0,(R0)
1363 010076  012737  011610  001240              MOV     #GGP5,@#$TMP3
```

```
        010104  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010112  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010120  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010126  104220                  1$:     ERROR   +220
        010130  000137  011660                  JMP     @#GGDONE
  1364
  1365  010134                          GGER1:
        010134  010537  001252                  MOV     R5,@#$TMP10
        010140  010437  001254                  MOV     R4,@#$TMP11
        010144  012737  011610  001240          MOV     #GGP5,@#$TMP3
        010152  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010160  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010166  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010174  104207                  1$:     ERROR   +207
        010176  000137  011660                  JMP     @#GGDONE
  1366
  1367  010202                          GGER2:
        010202  010537  001252                  MOV     R5,@#$TMP10
        010206  010437  001254                  MOV     R4,@#$TMP11
        010212  012737  011610  001240          MOV     #GGP5,@#$TMP3
        010220  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010226  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010234  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010242  104232                  1$:     ERROR   +232
        010244  000137  011660                  JMP     @#GGDONE
  1368
  1369  010250                          GGER3:
        010250  010537  001252                  MOV     R5,@#$TMP10
        010254  010437  001254                  MOV     R4,@#$TMP11
        010260  012737  011610  001240          MOV     #GGP5,@#$TMP3
        010266  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010274  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010302  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010310  104221                  1$:     ERROR   +221
        010312  000137  011660                  JMP     @#GGDONE
  1370
  1371  010316  000706                  GGER4:  BR      GGER1
  1372
  1373  010320                          GGER5:
        010320  010537  001252                  MOV     R5,@#$TMP10
        010324  010437  001254                  MOV     R4,@#$TMP11
        010330  012737  011610  001240          MOV     #GGP5,@#$TMP3
        010336  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010344  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010352  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010360  104226                  1$:     ERROR   +226
        010362  000137  011660                  JMP     @#GGDONE
  1374
  1375  010366                          GGER6:
        010366  010537  001252                  MOV     R5,@#$TMP10
        010372  010437  001254                  MOV     R4,@#$TMP11
        010376  012737  011610  001240          MOV     #GGP5,@#$TMP3
        010404  012737  011610  001242          MOV     #GGP5,@#$TMP4
        010412  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
        010420  012737  011620  001246          MOV     #GGP6,@#$TMP6
        010426  104227                  1$:     ERROR   +227
        010430  000137  011660                  JMP     @#GGDONE
```

```
1376
1377 010434  013701  001236          GGER7:  MOV     @#$TMP2,R1
1378 010440  062701  000002                  ADD     #2,R1
1379 010444  020116                          CMP     R1,(SP)
1380 010446  001402                          BEQ     10$
1381 010450  000137  036660          5$:     JMP     @#FPSPUR
1382 010454                          10$:
1383 010454  170301                          STST    R1
1384 010456  020127  000012                  CMP     R1,#12
1385 010462  001372                          BNE     5$
1386 010464  022626                          CMP     (SP)+,(SP)+
1387 010466  012700  011540                  MOV     #GGDATO,R0
1388 010472  174010                          STD     AC0,(R0)
1389 010474  012737  011570  001240          MOV     #GGP3,@#$TMP3
     010502  012737  011560  001242          MOV     #GGP2,@#$TMP4
     010510  012737  011540  001244          MOV     #GGDATO,@#$TMP5
     010516  012737  011620  001246          MOV     #GGP6,@#$TMP6
     010524  104224                  1$:     ERROR   +224
     010526  000137  011660                  JMP     @#GGDONE
1390
1391 010532                          GGER8:
     010532  010537  001252                  MOV     R5,@#$TMP10
     010536  010437  001254                  MOV     R4,@#$TMP11
     010542  012737  011570  001240          MOV     #GGP3,@#$TMP3
     010550  012737  011560  001242          MOV     #GGP2,@#$TMP4
     010556  012737  011540  001244          MOV     #GGDATO,@#$TMP5
     010564  012737  011620  001246          MOV     #GGP6,@#$TMP6
     010572  104207                  1$:     ERROR   +207
     010574  000137  011660                  JMP     @#GGDONE
1392
1393 010600                          GGER9:
     010600  010537  001252                  MOV     R5,@#$TMP10
     010604  010437  001254                  MOV     R4,@#$TMP11
     010610  012737  011570  001240          MOV     #GGP3,@#$TMP3
     010616  012737  011560  001242          MOV     #GGP2,@#$TMP4
     010624  012737  011540  001244          MOV     #GGDATO,@#$TMP5
     010632  012737  011620  001246          MOV     #GGP6,@#$TMP6
     010640  104232                  1$:     ERROR   +232
     010642  000137  011660                  JMP     @#GGDONE
1394
1395 010646                          GGER10:
     010646  010537  001252                  MOV     R5,@#$TMP10
     010652  010437  001254                  MOV     R4,@#$TMP11
     010656  012737  011570  001240          MOV     #GGP3,@#$TMP3
     010664  012737  011560  001242          MOV     #GGP2,@#$TMP4
     010672  012737  011540  001244          MOV     #GGDATO,@#$TMP5
     010700  012737  011630  001246          MOV     #GGP7,@#$TMP6
     010706  104225                  1$:     ERROR   +225
     010710  000137  011660                  JMP     @#GGDONE
1396
1397 010714                          GGER11:
     010714  010537  001252                  MOV     R5,@#$TMP10
     010720  010437  001254                  MOV     R4,@#$TMP11
     010724  012737  011570  001240          MOV     #GGP3,@#$TMP3
     010732  012737  011560  001242          MOV     #GGP2,@#$TMP4
     010740  012737  011540  001244          MOV     #GGDATO,@#$TMP5
     010746  012737  011630  001246          MOV     #GGP7,@#$TMP6
```

```
                010754  104207                  1$:     ERROR   +207
                010756  000137  011660                  JMP     @#GGDONE
          1398
          1399  010762                          GGER12:
                010762  010537  001252                  MOV     R5,@#$TMP10
                010766  010437  001254                  MOV     R4,@#$TMP11
                010772  012737  011570  001240          MOV     #GGP3,@#$TMP3
                011000  012737  011560  001242          MOV     #GGP2,@#$TMP4
                011006  012737  011540  001244          MOV     #GGDATO,@#$TMP5
                011014  012737  011630  001246          MOV     #GGP7,@#$TMP6
                011022  104231                  1$:     ERROR   +231
                011024  000137  011660                  JMP     @#GGDONE
          1400
          1401  011030                          GGER13:
                011030  010537  001252                  MOV     R5,@#$TMP10
                011034  010437  001254                  MOV     R4,@#$TMP11
                011040  012737  011570  001240          MOV     #GGP3,@#$TMP3
                011046  012737  011560  001242          MOV     #GGP2,@#$TMP4
                011054  012737  011540  001244          MOV     #GGDATO,@#$TMP5
                011062  012737  011630  001246          MOV     #GGP7,@#$TMP6
                011070  104230                  1$:     ERROR   +230
                011072  000137  011660                  JMP     @#GGDONE
          1402
          1403  011076  013701  001236          GGER14: MOV     @#$TMP2,R1
          1404  011102  062701  000002                  ADD     #2,R1
          1405  011106  020116                          CMP     R1,(SP)
          1406  011110  001402                          BEQ     10$
          1407  011112  000137  036660          5$:     JMP     @#FPSPUR
          1408  011116                          10$:
          1409  011116  170301                          STST    R1
          1410  011120  020127  000012                  CMP     R1,#12
          1411  011124  001372                          BNE     5$
          1412  011126  022626                          CMP     (SP)+,(SP)+
          1413  011130  012700  011540                  MOV     #GGDATO,R0
          1414  011134  174010                          STD     AC0,(R0)
          1415
          1416  011136  012737  011550  001240          MOV     #GGP1,@#$TMP3
                011144  012737  011570  001242          MOV     #GGP3,@#$TMP4
                011152  012737  011540  001244          MOV     #GGDATO,@#$TMP5
                011160  012737  011620  001246          MOV     #GGP6,@#$TMP6
                011166  104222                  1$:     ERROR   +222
                011170  000137  011660                  JMP     @#GGDONE
          1417
          1418  011174                          GGER15:
                011174  010537  001252                  MOV     R5,@#$TMP10
                011200  010437  001254                  MOV     R4,@#$TMP11
                011204  012737  011560  001240          MOV     #GGP2,@#$TMP3
                011212  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011220  012737  011540  001244          MOV     #GGDATO,@#$TMP5
                011226  012737  011620  001246          MOV     #GGP6,@#$TMP6
                011234  104207                  1$:     ERROR   +207
                011236  000137  011660                  JMP     @#GGDONE
          1419
          1420  011242                          GGER16:
                011242  010537  001252                  MOV     R5,@#$TMP10
                011246  010437  001254                  MOV     R4,@#$TMP11
                011252  012737  011560  001240          MOV     #GGP2,@#$TMP3
```

```
                011260  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011266  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
                011274  012737  011620  001246          MOV     #GGP6,@#$TMP6
                011302  104232                  1$:     ERROR   +232
                011304  000137  011660                  JMP     @#GGDONE
          1421
          1422  011310                          GGER17:
                011310  010537  001252                  MOV     R5,@#$TMP10
                011314  010437  001254                  MOV     R4,@#$TMP11
                011320  012737  011560  001240          MOV     #GGP2,@#$TMP3
                011326  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011334  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
                011342  012737  011650  001246          MOV     #GGP9,@#$TMP6
                011350  104223                  1$:     ERROR   +223
                011352  000137  011660                  JMP     @#GGDONE
          1423
          1424  011356                          GGER18.
                011356  010537  001252                  MOV     R5,@#$TMP10
                011362  010437  001254                  MOV     R4,@#$TMP11
                011366  012737  011560  001240          MOV     #GGP2,@#$TMP3
                011374  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011402  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
                011410  012737  011650  001246          MOV     #GGP9,@#$TMP6
                011416  104207                  1$:     ERROR   +207
                011420  000137  011660                  JMP     @#GGDONE
          1425
          1426  011424                          GGER19:
                011424  010537  001252                  MOV     R5,@#$TMP10
                011430  010437  001254                  MOV     R4,@#$TMP11
                011434  012737  011560  001240          MOV     #GGP2,@#$TMP3
                011442  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011450  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
                011456  012737  011650  001246          MOV     #GGP9,@#$TMP6
                011464  104230                  1$:     ERROR   +230
                011466  000137  011660                  JMP     @#GGDONE
          1427
          1428  011472                          GGER20:
                011472  010537  001252                  MOV     R5,@#$TMP10
                011476  010437  001254                  MOV     R4,@#$TMP11
                011502  012737  011560  001240          MOV     #GGP2,@#$TMP3
                011510  012737  011640  001242          MOV     #GGP8,@#$TMP4
                011516  012737  011540  001244          MOV     #GGDAT0,@#$TMP5
                011524  012737  011650  001246          MOV     #GGP9,@#$TMP6
                011532  104231                  1$:     ERROR   +231
                011534  000137  011660                  JMP     @#GGDONE
          1429
          1430  011540  000000                  GGDAT0: 0
          1431  011542  000000                          0
          1432  011544  000000                          0
          1433  011546  000000                          0
          1434
          1435  011550  000300                  GGP1:   300
          1436  011552  000000                          0
          1437  011554  000000                          0
          1438  011556  000000                          0
          1439  011560  100200                  GGP2:   100200
          1440  011562  000000                          0
```

```
1441 011564  000000                          0
1442 011566  000000                          0
1443 011570  000200                GGP3:     200
1444 011572  000000                          0
1445 011574  000000                          0
1446 011576  000001                          1
1447 011600  010200                GGP4:     10200
1448 011602  000000                          0
1449 011604  000000                          0
1450 011606  000000                          0
1451 011610  077600                GGP5:     77600          ;OVER FLOW = GGP5 + GGP5
1452 011612  000000                          0
1453 011614  000000                          0
1454 011616  000000                          0
1455 011620  000000                GGP6:     0              ;OVERFLOW RESULT
1456 011622  000000                          0              ;UNDERFLOW RESULT
1457 011624  000000                          0              ;GGP6 = GGP4 + GGP5
1458 011626  000000                          0              ;      = GGP3 + GGP2 (FIU - 0)
1459                                                        ;      = GGP3 + GGP1
1460 011630  062400                GGP7:     62400          ;GGP7 = GGP3 + GGP2 (FIU   1)
1461 011632  000000                          0
1462 011634  000000                          0
1463 011636  000000                          0
1464 011640  000340                GGP8:     340
1465 011642  000000                          0
1466 011644  000000                          0
1467 011646  000000                          0
1468 011650  000100                GGP9:     100
1469 011652  000000                          0
1470 011654  000000                          0
1471 011656  000000                          0
1472 011660                        GGDONE:
     011660  104412                          RSETUP         ;GO INITIALIZE THE FPS AND STACK; AND
                                               ;SEE IF THE USER HAS EXPRESSED
                                               ;THE DESIRE TO CHANGE THE SOFTWARE
                                               ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                               ;THE USER TYPED CONTROL G?).
1473
1479
1480                                   ;;*****************************************************************
                                       ;*TEST 3        LDCFD AND LDCDF TEST
                                       ;*
                                       ;*THIS IS A TEST OF LDCFD AND LDCDF.
                                       ;*
                                       ;;*****************************************************************
     011662  000004                    TST3:    SCOPE
1481                                   ;TEST FOR CORRECT AUTO INCREMENT CONSTANT.
1482 011664                            HX1:
     011664  104413                          LPERR          ;SET UP THE LOOP ON ERROR ADDRESS.
1483 011666  012704  000200                   MOV     #200,R4
1484 011672  170104                           LDFPS   R4
1485 011674  012700  013300                   MOV     #HXP1,R0
1486 011700  172410                           LDD     (R0),AC0
1487 011702  012700  013310                   MOV     #HXP2,R0
1488 011706  012737  011714  001236           MOV     #HX2,@#$TMP2
1489 011714  177420                    HX2:   LDCFD   (R0)+,AC0
1490 011716  020027  013314                   CMP     R0,#HXP2+4     ;IS R0 CORRECT
```

```
1491 011722  001402                        BEQ     HX3
1492 011724  000137  012656                JMP     @#HXER1
1493 011730                          HX3:
1494 011730  170205                        STFPS   R5              ;GET FPS
1495 011732  012700  013270                MOV     #HXDATO,R0
1496 011736  174010                        STD     AC0,(R0)        ;GET AC0
1497 011740  012701  013360                MOV     #HXP7,R1        ;SEE IF RESULT IS
1498 011744  012702  000004                MOV     #4,R2           ;CORRECT
1499 011750  022120                  HX4:  CMP     (R1)+,(R0)+
1500 011752  001415                        BEQ     HX7
1501 011754  012701  013310                MOV     #HXP2,R1        ;DID FD GET
1502 011760  012700  013270                MOV     #HXDATO,R0      ;COMPLIMENTED?
1503 011764  012702  000004                MOV     #4,R2
1504 011770  022120                  HX5:  CMP     (R1)+,(R0)+
1505 011772  001402                        BEQ     HX6
1506 011774  000137  012716                JMP     @#HXER2
1507 012000  077205                  HX6:  SOB     R2,HX5
1508 012002  000137  012746                JMP     @#HXER3
1509 012006  077220                  HX7:  SOB     R2,HX4
1510 012010  012704  000200                MOV     #200,R4         ;FPS CORRECT?
1511 012014  020405                        CMP     R4,R5
1512 012016  001402                        BEQ     HX8
1513 012020  000137  013014                JMP     @#HXER8
1514                                ;NOW    TEST    LDCDF
1515 012024                          HX8:
     012024  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1516 012026  012704  000200                        MOV #200,R4
1517 012032  170104                        LDFPS R4
1518
1519 012034  012700  013300                MOV     #HXP1,R0
1520 012040  172410                        LDD     (R0),AC0
1521
1522 012042  012700  013310                MOV     #HXP2,R0
1523 012046  012737  012056  001236        MOV     #HX9,@#$TMP2
1524
1525 012054  170001                        SETF
1526
1527 012056  177420                  HX9:  LDCDF   (R0)+,AC0       ;TEST INSTRUCTION
1528
1529 012060  020027  013320                CMP     R0,#HXP2+10     ;WAS A GOOD
1530 012064  001402                        BEQ     HX10            ;CONSTANT USED
1531 012066  000137  012676                JMP     @#HXER5         ;TO INCREMENT R0?
1532
1533 012072                          HX10:
1534 012072  170205                        STFPS   R5
1535 012074  012700  013270                MOV     #HXDATO,R0
1536 012100  170011                        SETD
1537 012102  174010                        STD     AC0,(R0)        ;GET RESULT
1538 012104  012701  013370                MOV     #HXP8,R1
1539 012110  012702  000004                MOV     #4,R2
1540 012114  022120                  HX11: CMP     (R1)+,(R0)+     ;IS IT CORRECT?
1541 012116  001415                        BEQ     HX14
1542
1543 012120  012701  013360                MOV     #HXP7,R1
1544 012124  012700  013270                MOV     #HXDATO,R0
1545 012130  012702  000004                MOV     #4,R2
1546 012134  022110                  HX12: CMP     (R1)+,(R0)      ;DID FD FAIL TO GET
```

```
1547 012136  001402                          BEQ     HX13            ;COMPLIMENTED?
1548 012140  000137  013032                  JMP     @#HXER6
1549 012144  077205                  HX13:   SOB     R2,HX12
1550 012146  000137  013062                  JMP     @#HXER7
1551
1552 012152  077220                  HX14:   SOB     R2,HX11
1553
1554 012154  012704  000000                  MOV     #0,R4           ;FPS CORRECT?
1555 012160  020405                          CMP     R4,R5
1556 012162  001402                          BEQ     HX15
1557 012164  000137  013014                  JMP     @#HXER8
1558
1559                                 ;TEST GR7 IMMEDIATE MODE CONSTANT
1560
1561 012170                          HX15:
     012170  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1562
1563 012172  012704  000200                  MOV     #200,R4
1564 012176  170104                          LDFPS   R4              ;SET FD
1565 012200  012737  012216  001236          MOV     #HX16,@#$TMP2
1566 012206  012737  013112  000004          MOV     #HXER9,@#ERRVECT
1567 012214  005001                          CLR     R1
1568 012216  177427  043243          HX16:   LDCFD   #5201,AC0
1569 012222  005201                  HX165:  INC     R1
1570 012224  005201                          INC     R1
1571 012226  005201                          INC     R1
1572 012230  012737  036712  000004          MOV     #CPSPUR,@#ERRVECT
1573 012236  020127  000003                  CMP     R1,#3           ;SEE IF PC WAS
1574 012242  001402                          BEQ     HX17            ;CORRECT
1575 012244  000137  013146                  JMP     @#HXER10
1576
1577 012250                          HX17:
     012250  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1578
1579 012252  012704  000200                  MOV     #200,R4
1580 012256  170104                          LDFPS   R4
1581 012260  012737  012306  001236          MOV     #HX18,@#$TMP2
1582 012266  012700  013350                  MOV     #HXP6,R0
1583 012272  172410                          LDD     (R0),AC0
1584 012274  012737  036712  000004          MOV     #CPSPUR,@#ERRVECT
1585 012302  012700  013310                  MOV     #HXP2,R0
1586 012306  177410                  HX18:   LDCFD   (R0),AC0
1587
1588 012310  012700  013270                  MOV     #HXDAT0,R0
1589 012314  174010                          STD     AC0,(R0)        ;GET RESULT.
1590 012316  012701  013360                  MOV     #HXP7,R1
1591 012322  012702  000004                  MOV     #4,R2
1592 012326  022021                  HX19:   CMP     (R0)+,(R1)+     ;IS RESULT CORRECT?
1593 012330  001402                          BEQ     HX20
1594 012332  000137  012716                  JMP     @#HXFR2
1595 012336  077205                  HX20:   SOB     R2,HX19
1596
1597                                 ;TEST LDCFD WITH NEGATIVE OPERAND
1598 012340                          HX21:
     012340  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1599 012342  012704  000200                  MOV     #200,R4
1600 012346  170104                          LDFPS   R4
```

```
1601 012350 012737 012370 001236          MOV     #HX22,@#$TMP2
1602 012356 012700 013350                 MOV     #HXP6,R0
1603 012362 172410                        LDD     (R0),AC0
1604 012364 012700 013330                 MOV     #HXP4,R0
1605 012370 177410              HX22:     LDCFD   (R0),AC0
1606
1607 012372 012700 013270                 MOV     #HXDAT0,R0
1608 012376 174010                        STD     AC0,(R0)        ;GET RESULT
1609
1610 012400 012701 013340                 MOV     #HXP5,R1
1611 012404 012702 000004                 MOV     #4,R2
1612 012410 022120              HX23:     CMP     (R1)+,(R0)+
1613 012412 001415                        BEQ     HX26
1614
1615 012414 012701 013360                 MOV     #HXP7,R1
1616 012420 012700 013270                 MOV     #HXDAT0,R0
1617 012424 012702 000004                 MOV     #4,R2
1618 012430 022120              HX24:     CMP     (R1)+,(R0)+     ;WAS SIGN INCORRECT
1619 012432 001402                        BEQ     HX25
1620 012434 000137 013200                 JMP     @#HXER11
1621 012440 077205              HX25:     SOB     R2,HX24
1622 012442 000137 013220                 JMP     @#HXER12
1623
1624 012446 077220              HX26:     SOB     R2,HX23
1625
1626                            ;TEST     LDCFD   0
1627
1628 012450                     HX27:
     012450 104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1629 012452 012704 000200                 MOV     #200,R4
1630 012456 170104                        LDFPS   R4
1631
1632 012460 012700 013300                 MOV     #HXP1,R0
1633 012464 172410                        LDD     (R0),AC0
1634 012466 172010                        ADDD    (R0),AC0
1635
1636 012470 012737 012502 001236          MOV     #HX28,@#$TMP2
1637 012476 012700 013300                 MOV     #HXP1,R0
1638 012502 177410              HX28:     LDCFD   (R0),AC0
1639
1640 012504 170205                        STFPS   R5
1641
1642 012506 012700 013270                 MOV     #HXDAT0,R0
1643 012512 174010                        STD     AC0,(R0)        ;GET RESULT
1644
1645 012514 012701 013300                 MOV     #HXP1,R1
1646 012520 012702 000004                 MOV     #4,R2
1647 012524 022120              HX29:     CMP     (R1)+,(R0)+     ;IS IT 0?
1648 012526 001402                        BEQ     HX30
1649 012530 000137 013250                 JMP     @#HXER13
1650 012534 077205              HX30:     SOB     R2,HX29
1651
1652 012536 012704 000204                 MOV     #204,R4         ;FPS CORRECT
1653 012542 020405                        CMP     R4,R5
1654 012544 001402                        BEQ     HX31
1655 012546 000137 012776                 JMP     @#HXER4
1656
```

```
                                        ;TEST   LDCFD   0

                                        HX31:
012552  104413                                  LFERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
012554  012704  000200                          MOV     #200,R4
012560  170104                                  LDFPS   R4

012562  012700  013350                          MOV     #HXP6,R0
012566  172410                                  LDD     (R0),AC0

012570  012737  012602  001236                  MOV     #HX32,@#$TMP2
012576  012700  013300                          MOV     #HXP1,R0
012602  177410                        HX32:     LDCFD   (R0),AC0

012604  170205                                  STFPS   R5

012606  012700  013270                          MOV     #HXDAT0,R0
012612  174010                                  STD     AC0,(R0)        ;GET RESULT

012614  012701  013300                          MOV     #HXP1,R1
012620  012702  000004                          MOV     #4,R2
012624  022120                        HX33:     CMP     (R1)+,(R0)+     ;IS IT ZERO?
012626  001402                                  BEQ     HX34
012630  000137  013250                          JMP     @#HXER13
012634  077205                        HX34:     SOB     R2,HX33

012636  012704  000204                          MOV     #204,R4         ;FPS CORRECT?
012642  020405                                  CMP     R4,R5
012644  001402                                  BEQ     HX35
012646  000137  012776                          JMP     @#HXER4
012652  000137  013400                HX35:     JMP     @#HXDONE

                                        ;R0 INCORRECT

012656  012737  013314  001242        HXER1:    MOV     #HXP2+4,@#$TMP4
012664  010037  001240                          MOV     R0,@#$TMP3
012670  104234                        1$:       ERROR   +234
012672  000137  013400                          JMP     @#HXDONE

012676  012737  013320  001242        HXER5:    MOV     #HXP2+10,@#$TMP4
012704  010037  001240                          MOV     R0,@#$TMP3
012710  104237                        1$:       ERROR   +237
012712  000137  013400                          JMP     @#HXDONE
                                        ;REPORT BAD DATA
012716  012737  013310  001244        HXER2:    MOV     #HXP2,@#$TMP5
012724  012737  013360  001250                  MOV     #HXP7,@#$TMP7
012732  012737  013270  001246        HXER22:   MOV     #HXDAT0,@#$TMP6
012740  104233                        1$:       ERROR   +233
012742  000137  013400                          JMP     @#HXDONE
                                        ;
012746  012737  013310  001244        HXER3:    MOV     #HXP2,@#$TMP5
012754  012737  013360  001250                  MOV     #HXP7,@#$TMP7
012762  012737  013270  001246        HXER33:   MOV     #HXDAT0,@#$TMP6
012770  104241                        1$:       ERROR   +241
012772  000137  013400                          JMP     @#HXDONE

012776  010537  001240                HXER4:    MOV     R5,@#$TMP3
```

```
1713 013002  010437  001242            MOV     R4,@#$TMP4
1714 013006  104240              1$:   ERROR   +240
1715 013010  000137  013400            JMP     @#HXDONE
1716
1717 013014  010537  001240      HXER8:  MOV     R5,@#$TMP3
1718 013020  010437  001242              MOV     R4,@#$TMP4
1719 013024  104242              1$:   ERROR   +242
1720 013026  000137  013400            JMP     @#HXDONE
1721 013032  012737  013310  001244  HXER6:  MOV     #HXP2,@#$TMP5
1722 013040  012737  013370  001250          MOV     #HXP8,@#$TMP7
1723 013046  012737  013270  001246  HXER66: MOV     #HXDAT0,@#$TMP6
1724 013054  104244              1$:   ERROR   +244
1725 013056  000137  013400            JMP     @#HXDONE
1726
1727 013062  012737  013310  001244  HXER7:  MOV     #HXP2,@#$TMP5
1728 013070  012737  013370  001250          MOV     #HXP8,@#$TMP7
1729 013076  012737  013270  001246          MOV     #HXDAT0,@#$TMP6
1730 013104  104243              1$:   ERROR   +243
1731 013106  000137  013400            JMP     @#HXDONE
1732
1733 013112  032716  000001      HXER9:  BIT     #1,(SP)         ;SEE IF IT
1734 013116  001005                      BNE     1$              ;AN ODD ADDRESS
1735 013120  022716  012222              CMP     #HX165,(SP)
1736 013124  001402                      BEQ     1$
1737 013126  000137  036712              JMP     @#CPSPUR
1738
1739 013132  011637  001236          1$: MOV     (SP),@#$TMP2
1740 013136  022626                      CMP     (SP)+,(SP)+
1741 013140  104235              2$:   ERROR   +235
1742 013142  000137  013400            JMP     @#HXDONE
1743
1744 013146  162701  000003      HXER10: SUB     #3,R1
1745 013152  006301                      ASL     R1
1746 013154  012702  012222              MOV     #HX165,R2
1747 013160  010237  001242              MOV     R2,@#$TMP4
1748 013164  160102                      SUB     R1,R2
1749 013166  010237  001240              MOV     R2,@#$TMP3
1750 013172  104236              1$:   ERROR   +236
1751 013174  000137  013400            JMP     @#HXDONE
1752
1753 013200  012737  013330  001244  HXER11: MOV     #HXP4,@#$TMP5
1754 013206  012737  013340  001250          MOV     #HXP5,@#$TMP7
1755 013214  000137  012732              JMP     @#HXER22
1756 013220  012737  013330  001244  HXER12: MOV     #HXP4,@#$TMP5
1757 013226  012737  013340  001250          MOV     #HXP5,@#$TMP7
1758 013234  012737  013270  001246          MOV     #HXDAT0,@#$TMP6
1759 013242  104245              1$:   ERROR   +245
1760 013244  000137  013400            JMP     @#HXDONE
1761
1762 013250  012737  013300  001244  HXER13: MOV     #HXP1,@#$TMP5
1763 013256  012737  013300  001250          MOV     #HXP1,@#$TMP7
1764 013264  000137  012732              JMP     @#HXER22
1765
1766 013270  000000              HXDATC: 0
1767 013272  000000                      0
1768 013274  000000                      0
1769 013276  000000                      0
```

```
1770
1771 013300  000000                HXP1:   0
1772 013302  000000                        0
1773 013304  000000                        0
1774 013306  000000                        0
1775
1776 013310  000577                HXP2:   577
1777 013312  177776                        177776
1778 013314  177777                        177777
1779 013316  177776                        177776
1780 013320  005201                HXP3:   5201
1781 013322  000000                        0
1782 013324  000000                        0
1783 013326  000000                        0
1784 013330  100577                HXP4:   100577
1785 013332  177776                        177776
1786 013334  177777                        177777
1787 013336  177776                        177776
1788 013340  100577                HXP5:   100577
1789 013342  177776                        177776
1790 013344  000000                        0
1791 013346  000000                        0
1792 013350  000252                HXP6:   252
1793 013352  125252                        125252
1794 013354  125252                        125252
1795 013356  125252                        125252
1796
1797 013360  000577                HXP7:   577
1798 013362  177776                        177776
1799 013364  000000                        0
1800 013366  000000                        0
1801 013370  000577                HXP8:   577
1802 013372  177777                        177777
1803 013374  000000                        0
1804 013376  000000                        0
1805
1806 013400                        HXDONE:
     013400  104412                        RSETUP          ;GO INITIALIZE THE FPS AND STACK; AND
                                             ;SEE IF THE USER HAS EXPRESSED
                                             ;THE DESIRE TO CHANGE THE SOFTWARE
                                             ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                             ;THE USER TYPED CONTROL G?).
1807
1808
1809
1817
1818                                ;;******************************************************************
                                    ;*TEST 4        CMPD TEST
                                    ;*
                                    ;*THIS IS A TEST OF THE CMPD INSTRUCTION. NOTE THAT A SUBROUTINE
                                    ;*IS USED TO SET UP OPERANDS, EXECUTE THE INSTRUCTION AND CHECK THE
                                    ;*RESULTS
                                    ;*
                                    ;;******************************************************************
     013402  000004                TST4:   SCOPE
1819
1820                                ;TEST THE CMPD INSTRUCTION WITH (FSRC=AC=0)
```

```
1821 013404                          AAA1:
     013404  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1822 013406  004737  014216                  JSR     PC,@#CMPSUB
1823 013412  000000  000000  000000  1$:     .WORD   0,0,0,0                 ;AC0
     013420  000000
1824 013422  000000  000000  000000  2$:     .WORD   0,0,0,0                 ;FSRC
     013430  000000
1825 013432  000200                  3$:     200                             ;FPS BEFORE EXECUTION
1826 013434  000204                          204                             ;FPS AFTER EXECUTION
1827 013436  000200                          200                             ;ERROR FPS
1828 013440  104001                  4$:     ERROR   +1                      ;FPS ERROR
1829
1830
1831                                 ;TEST CMPD WITH (AC=0) AND FSRC POSITIVE.
1832 013442                          AAA2:
     013442  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1833 013444  004737  014216                  JSR     PC,@#CMPSUB
1834 013450  000000  000000  000000  1$:     .WORD   0,0,0,0                 ;AC
     013456  000000
1835 013460  025252                  2$:     25252                           ;FSRC
1836 013462  052525                          52525
1837 013464  125252                          125252
1838 013466  052525                          52525
1839 013470  000200                  3$:     200                             ;FPS BEFORE EXECUTION
1840 013472  000200                          200                             ;FPS AFTER EXECUTION
1841 013474  000210                          210                             ;ERROR FPS
1842 013476  104003                  4$:     ERROR   +3                      ;FPS ERROR
1843
1844                                 ;TEST CMPD WITH (AC=0) AND FSRC NEGATIVE
1845 013500                          AAA3:
     013500  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1846 013502  004737  014216                  JSR     PC,@#CMPSUB
1847 013506  000000  000000  000000  1$:     .WORD   0,0,0,0                 ;AC
     013514  000000
1848 013516  125252                  2$:     125252                          ;FSRC
1849 013520  125252                          125252
1850 013522  052525                          52525
1851 013524  125252                          125252
1852 013526  000200                  3$:     200                             ;FPS BEFORE EXECUTION
1853 013530  000210                          210                             ;FPS AFTER EXECUTION
1854 013532  000200                          200                             ;ERROR FPS
1855 013534  104004                  4$:     ERROR   +4                      ;FPS ERROR.
1856
1857                                 ;TEST CMPD WITH (FSRC=0) AND AC POSITIVE
1858 013536                          AAA4:
     013536  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1859 013540  004737  014216                  JSR     PC,@#CMPSUB
1860 013544  025252                  1$:     25252                           ;AC
1861 013546  052525                          52525
1862 013550  125252                          125252
1863 013552  052525                          52525
1864 013554  000000  000000  000000  2$:     .WORD   0,0,0,0                 ;FSRC
     013562  000000
1865 013564  000200                  3$:     200                             ;FPS BEFORE EXECUTION
 866 013566  000210                          210                             ;FPS AFTER EXECUTION
1867 013570  000200                          200                             ;ERROR FPS
1868 013572  104005                  4$:     ERROR   +5                      ;FPS ERROR
```

```
                                        ;TEST CMPD WITH (FSRC=0) AND AC NEGATIVE
013574                                  AAA5:
013574  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
013576  004737  014216                        JSR     PC,@#CMPSUB
013602  125252                        1$:     125252                  ;AC
013604  125252                                125252
013606  052525                                52525
013610  125252                                125252
013612  000000  000000  000000        2$:     .WORD   0,0,0,0         ;FSRC
013620  000000
013622  000200                        3$:     200                     ;FPS BEFORE EXECUTION
013624  000200                                200                     ;FPS AFTER EXECUTION
013626  000210                                210                     ;ERROR FPS
013630  104006                        4$:     ERROR   +6              ;FPS ERROR

                                        ;TEST CMPD WITH AC POSITIVE AND FSRC NEGATIVE
013632                                  AAA6:
013632  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
013634  004737  014216                        JSR     PC,@#CMPSUB
013640  052525                        1$:     52525                   ;AC
013642  125252                                125252
013644  052525                                52525
013646  125252                                125252
013650  125252                        2$:     125252                  ;;FSRC
013652  052525                                52525
013654  125252                                125252
013656  052525                                52525
013660  000200                        3$:     200                     ;FPS BEFORE EXECUTION
013662  000210                                210                     ;FPS AFTER EXECUTION
013664  000200                                200                     ;ERROR FPS
013666  104007                        4$:     ERROR   +7              ;FPS ERROR


                                        ;TEST CMPD WITH AC NEGATIVE AND FSRC POSITIVE
013670                                  AAA7:
013670  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
013672  004737  014216                        JSR     PC,@#CMPSUB
013676  125252                        1$:     125252                  ;AC
013700  052525                                52525
013702  125252                                125252
013704  052525                                52525
013706  052525                        2$:     52525                   ;FSRC
013710  125252                                125252
013712  052525                                52525
013714  125252                                125252
013716  000200                        3$:     200                     ;FPS BEFORE EXECUTION
013720  000200                                200                     ;FPS AFTER EXECUTION
013722  000210                                210                     ;ERROR FPS
013724  104010                        4$:     ERROR   +10             ;FPS ERROR.

                                        ;TEST CMPD WITH AC POSITIVE AND FSRC POSITIVE
                                        ;AND EAC LESS THAN EFSRC.
013726                                  AAA8:
013726  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
013730  004737  014216                        JSR     PC,@#CMPSUB
```

```
1921 013734  012345                1$:     12345                           ;AC
1922 013736  067654                        67654
1923 013740  032101                        32101
1924 013742  023456                        23456
1925 013744  023456                2$:     23456                           ;FSRC
1926 013746  076543                        76543
1927 013750  021012                        21012
1928 013752  034567                        34567
1929 013754  000200                3$:     200                             ;FPS BEFORE EXECUTION
1930 013756  000200                        200                             ;FPS AFTER EXECUTION
1931 013760  000210                        210                             ;ERROR FPS
1932 013762  104011                4$:     ERROR   +11                     ;FPS ERROR
1933
1934
1935                                ;TEST CMPD WITH AC POSITIVE, FSRC POSITIVE AND EAC GREATER THAN EFSRC
1936 013764                        AAA9:
     013764  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1937 013766  004737  014216                JSR     PC,@#CMPSUB
1938 013772  045676                1$:     45676                           ;AC
1939 013774  054321                        54321
1940 013776  012345                        12345
1941 014000  067654                        67654
1942 014002  034567                2$:     34567                           ;FSRC
1943 014004  065432                        65432
1944 014006  101234                        101234
1945 014010  056765                        56765
1946 014012  000200                3$:     200                             ;FPS BEFORE EXECUTION
1947 014014  000210                        210                             ;FPS AFTER EXECUTION
1948 014016  000200                        200                             ;ERROR FPS
1949 014020  104012                4$:     ERROR   +12
1950
1951                                ;TEST CMPD WITH AC POSITIVE, FSRC POSITIVE AND AC EQUAL TO FSRC
1952 014022                        AAA10:
     014022  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
1953 014024  004737  014216                JSR     PC,@#CMPSUB
1954 014030  012345                1$:     12345                           ;AC
1955 014032  067012                        67012
1956 014034  034567                        34567
1957 014036  012345                        012345
1958 014040  012345                2$:     12345                           ;FSRC
1959 014042  067012                        67012
1960 014044  034567                        34567
1961 014046  012345                        012345
1962 014050  000200                3$:     200                             ;FPS BEFORE EXECUTION
```

```
                                                    204                             ;FPS AFTER EXECUTION
                                                    200                             ;ERROR FPS
                                    4$:     ERROR   +13                             ;FPS ERROR

                                    ;TEST CMPD WITH AC POSITIVE, FSRC POSITIVE, EAC EQUAL TO EFSRC,
                                    ;AND FSRC GREATER THAN AC.
014060                              AAA11:
014060  104413                              LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
014062  004737  014216                      JSR     PC,@#CMPSUB
014066  012345                      1$:     12345                           ;AC
014070  067012                              67012
014072  034567                              34567
014074  012345                              012345
014076  012345                      2$:     12345                           ;FSRC
014100  070123                              70123
014102  045670                              45670
014104  123456                              123456
014106  000200                      3$:     200                             ;FPS BEFORE EXECUTION
014110  000200                              200                             ;FPS AFTER EXECUTION
014112  000210                              210                             ;ERROR FPS
014114  104014                      4$:     ERROR   +14                     ;FPS ERROR

                                    ;TEST CMPD WITH AC POSITIVE, FSRC POSITIVE, EAC EQUAL TO EFSRC,
                                    ;AND AC GREATER THAN FSRC.
014116                              AAA12:
014116  104413                              LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
014120  004737  014216                      JSR     PC,@#CMPSUB
014124  054321                      1$:     54321                           ;AC
014126  076543                              76543
014130  021076                              21076
014132  054321                              54321
014134  054321                      2$:     54321                           ;FSRC
014136  065432                              65432
014140  107654                              107654
014142  032107                              32107
014144  000200                      3$:     200                             ;FPS BEFORE EXECUTION
014146  000210                              210                             ;FPS AFTER EXECUTION
014150  000200                              200                             ;ERROR FPS
014152  104015                      4$:     ERROR   +15                     ;FPS ERROR

                                    ;TEST CMPD WITH AC NEGATIVE, FSRC NEGATIVE, EAC EQUAL TO EFSRC,
                                    ;AND AC GREATER THAN FSRC
014154                              AAA13:
014154  104413                              LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
014156  004737  014216                      JSR     PC,@#CMPSUB
014162  112345                      1$·     112345                          ;AC
014164  043210                              43210
014166  076543                              76543
014170  021076                              21076
014172  112345                      2$:     112345                          ;FSRC
014174  054321                              54321
014176  007654                              07654
014200  032107                              32107
014202  000200                      3$:     200                             ;FPS BEFORE EXECUTION
014204  000210                              210                             ;FPS AFTER EXECUTION
014206  000200                              200                             ;ERROR FPS
014210  104016                      4$:     ERROR   +16                     ;FPS ERROR
```

```
2018
2019
2020 014212  000137  014406                  JMP     @#AAADONE               ;FINISHED CMPD TEST.
2021
2022
2023                                ;THIS SUBROUTINE, CMPSUB, IS CALLED TO SET UP, EXECUTE
2024                                ;AND CHECK THE RESULTS OF A CMPD INSTRUCTION.
2025                                ;IT IS CALLED THUS:
2026                                ;
2027                                ;               JSR     PC,@#CMPSUB
2028                                ;       ACARG:  .WORD   X,X,X,X                 ;AC OPERAND
2029                                ;       FSRCARG:.WORD   X,X,X,X                 ;FSRC OPERAND
2030                                ;       FPSB:   .WORD   X                       ;FPS BEFORE EXECUTION
2031                                ;       FPSA:   .WORD   X                       ;FPS AFTER EXECUTION
2032                                ;       FPSE:   .WORD   X                       ;ERROR FPS
2033                                ;       ERR:    ERROR   +X                      ;FPS ERROR
2034                                ;       CONT:                                   ;RETURN ADDRESS
2035                                ;
2036                                ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC OPERAND). THEN
2037                                ;FPSB IS LOADED INTO THE FPS. THE INSTRUCTION, CMPD, IS EXECUTED.
2038                                ;AFTER THE EXECUTION THE FPS IS CHECKED AGAINST FPSA. IF IT IS A MATCH
2039                                ;THEN THERE WAS NO ERROR AND CONTROL IS RETURNED TO CONT. IF
2040                                ;THE FPS IS INCORRECT IT IS COMPARED WITH FPSE IN AN ATTEMPT TO ANALYSE
2041                                ;THE FAILURE. IF THE FPS IS THE SAME AS FPSE THEN CONTROL IS
2042                                ;RETURNED TO THE ERROR CALL AT LOCATION ERR. IF THE FPS WAS
2043                                ;NOT CORRECT BUT DIDN'T MATCH FPSE A GENERAL ERROR IS REPORTED
2044                                ;AND CONTROL IS PASSED TO CONT.
2045
2046 014216  012601                  CMPSUB: MOV     (SP)+,R1                ;PICK UP A POINTER TO THE
2047                                                                          ;ARGUMENTS.
2048 014220  016100  000020                  MOV     20(R1),R0               ;GET THE FPS BEFORE EXECUTION.
2049 014224  170100                          LDFPS   R0                      ;LOAD IT INTO THE FPS.
2050
2051 014226  012737  014250  001236          MOV     #1$,@#$TMP2             ;SAVE ADDRESS OF CMPD INSTRUCTION.
2052 014234  010100                          MOV     R1,R0                   ;GET ADDRESS OF AC OPERAND.
2053 014236  172410                          LDD     (R0),AC0                ;LOAD AC0 OPERAND
2054
2055 014240  010100                          MOV     R1,R0                   ;COMPUTE FSRC OPERAND
2056 014242  062700  000010                  ADD     #10,R0                  ;ADDRESS
2057
2058 014246  000240                          NOP                             ;FOR SCOPING.
2059 014250  173410                  1$:     CMPD    (R0),AC0                ;EXECUTE THE TEST INSTRUCTION.
2060
2061 014252  170205                          STFPS   R5                      ;SAVE FPS AFTER INSTRUCTION.
2062
2063 014254  016104  000022                  MOV     22(R1),R4               ;GET EXPECTED FPS.
2064                                                                          ;IF INCORRECT SET UP FOR
2065 014260  010137  001240                  MOV     R1,@#$TMP3              ;AN ERROR CALL.
2066 014264  010137  001242                  MOV     R1,@#$TMP4
2067 014270  062737  000010  001242          ADD     #10,@#$TMP4
2068 014276  010537  001244                  MOV     R5,@#$TMP5
2069 014302  010437  001246                  MOV     R4,@#$TMP6
2070 014306  020405                          CMP     R4,R5                   ;WAS FPS CORRECT?
2071 014310  001410                          BEQ     3$                      ;BRANCH IF YES.
2072
2073
2074 014312  026105  000024                  CMP     24(R1),R5               ;WAS THE FPS THE SAME
```

```
                                                               ;AS THE EXPECTED INCORRECT FPS?
014316  001003                           BNE     2$            ;BRANCH IF NO MATCH.

014320  062701  000026                   ADD     #26,R1        ;IF THE EXPECTED INCORRECT
                                                        ;FPS MATCHED THE RESULTANT FPS
014324  000111                           JMP     (R1)          ;RETURN TO THE ERROR CALL
                                                               ;IN THE CALLING ROUTINE.

014326  104001                  2$:      ERROR   +1            ;OTHERWISE REPORT INCORRECT FPS
014330  000411                           BR      5$

014332  012700  014376          3$:      MOV     #CMPTMP,R0    ;IF FPS WAS CORRECT MAKE SURE
014336  174010                           STD     AC0,(R0)      ;AC0 WAS NOT AFFECTED BY CMPD.
014340  010102                           MOV     R1,R2
014342  012703  000004                   MOV     #4,R3
014346  022220                  4$:      CMP     (R2)+,(R0)+
014350  001003                           BNE     6$
014352  077303                           SOB     R3,4$

014354  000161  000030          5$:      JMP     30(R1)        ;RETURN

014360                          6$:                            ;REPORT AC0 MODIFIED BY CMPD
014360  010137  001240                   MOV     R1,@#$TMP3
014364  012737  014376  001242           MOV     #CMPTMP,@#$TMP4
014372  104002                  7$:      ERROR   +2
014374  000767                           BR      5$            ;RETURN

014376  000000  000000  000000  CMPTMP:  .WORD   0,0,0,0
014404  000000



014406                          AAADONE:
014406  104412                           RSETUP         ;GO INITIALIZE THE FPS AND STACK; AND
                                                        ;SEE IF THE USER HAS EXPRESSED
                                                        ;THE DESIRE TO CHANGE THE SOFTWARE
                                                        ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                        ;THE USER TYPED CONTROL G?).




                                ;;*************************************************************
                                ;;*TEST 5         DIVD WITH (FSRC=0) AND (BUT FD) TEST
                                ;;*
                                ;;*THIS IS A TEST OF THE DIVD INSTRUCTION WITH A
                                ;;*ZERO DIVISOR. THE CONDITION IS CHECKED WITH BOTH
                                ;;*TRAP ENABLED AND TRAPS DISABLED.
                                ;;*
                                ;;*************************************************************
014410  000004                  TST5:    SCOPE

                                ;FIRST TEST DIVD WITH (FSRC-AC=0) AND TRAPS DISABLED.
014412  104413                           LPERR          ;SET UP THE LOOP ON ERROR ADDRESS.
014414  012704  040200          BBB0:    MOV     #40200,R4     ;SET UP FPS
                                                        ;WITH INTERRUPTS
                                                        ;DISABLED.
```

```
2125 014420  170104                          LDFPS   R4
2126 014422  012737  014664  000244          MOV     #BBBER1,@#FPVECT;SET UP FOR ANY FP INTERRUPTS.
2127 014430  012737  014450  001236          MOV     #BBB1,@#$TMP2
2128 014436  012700  015070                  MOV     #BBBP1,R0       ;SET UP AC0 = 0
2129 014442  172410                          LDD     (R0),AC0
2130 014444  012701  015070                  MOV     #BBBP1,R1       ;FSRC = 0
2131
2132 014450  174411                  BBB1:   DIVD    (R1),AC0        ;TEST INSTRUCTION
2133
2134 014452  170205                          STFPS   R5              ;GET FPS
2135 014454  170303                          STST    R3              ;GET FEC
2136
2137 014456  012704  140204                  MOV     #140204,R4      ;EXPECTED FPS.
2138 014462  020405                          CMP     R4,R5           ;IS FPS CORRECT.
2139 014464  001131                          BNE     BBBER2          ;IF INCORRECT BRANCH.
2140
2141 014466  012702  000004                  MOV     #4,R2           ;EXPECTED FEC.
2142 014472  020203                          CMP     R2,R3           ;IS FEC CORRECT?
2143 014474  001140                          BNE     BBBER3          ;IF INCORRECT BRANCH.
2144
2145                              ;TEST DIVD WITH (FSRC=0) AND TRAPS DISABLED.
2146 014476                       BBB2:
     014476  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2147 014500  012704  040200                  MOV     #40200,R4       ;LOAD FPS WITH TRAPS DISABLED.
2148 014504  170104                          LDFPS   R4
2149
2150 014506  012737  014526  001236          MOV     #BBB3,@#$TMP2
2151 014514  012700  015100                  MOV     #BBBP2,R0       ;SET UP AC0 OPERAND (NON ZERO).
2152 014520  172410                          LDD     (R0),AC0
2153 014522  012700  015070                  MOV     #BBBP1,R0       ;FSRC=0
2154 014526  174410                  BBB3:   DIVD    (R0),AC0
2155
2156 014530  170205                          STFPS   R5              ;GET FPS.
2157 014532  170303                          STST    R3              ;GET FEC.
2158
2159 014534  012704  140200                  MOV     #140200,R4              ;EXPECTED FPS.
2160 014540  020405                          CMP     R4,R5           ;IS FPS CORRECT?
2161 014542  001102                          BNE     BBBER2          ;IF INCORRECT BRANCH.
2162
2163 014544  012702  000004                  MOV     #4,R2           ;EXPECTED FEC.
2164 014550  020203                          CMP     R2,R3           ;WAS FEC CORRECT?
2165 014552  001111                          BNE     BBBER3          ;IF INCORRECT BRANCH.
2166
2167                              ;TEST DIVD WITH FSRC=0) AND TRAPS ENABLED.
2168 014554                       BBB4:
     014554  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2169 014556  012704  000200                  MOV     #200,R4         ;SET UP FPS. TRAP ENABLED.
2170 014562  170104                          LDFPS   R4
2171
2172 014564  012737  014612  001236          MOV     #BBB5,@#$TMP2
2173 014572  012700  015100                  MOV     #BBBP2,R0       ;SET UP AC0 OPERAND (NON ZERO).
2174 014576  172410                          LDD     (R0),AC0
2175
2176 014600  012737  014620  000244          MOV     #BBB6,@#FPVECT  ;SET UP FOR THE EXPECTED INTERRUPT.
2177 014606  012700  015070                  MOV     #BBBP1,R0       ;FSRC=0
2178
2179 014612  174410                  BBB5:   DIVD    (R0),AC0        ;TEST INSTRUCTION (SHOULD RESULT IN TRAP).
```

```
2180 014614  170000                        CFCC
2181
2182 014616  000502                        BR      BBBER4          ;GO REPORT FAILURE, NO TRAP.
2183
2184 014620  022716  014614          BBB6: CMP     #BBB5+2,(SP)    ;TRAP TO HERE WHEN THE DIVISION BY 0
2185                                                                ;OCCURS. FIRST SEE IF THE ADDRESS OF
2186                                                                ;THE TRAP IS 2+THE ADDRESS OF THE TEST
2187                                                                ;DIVD INSTRUCTION.
2188 014624  001402                        BEQ     1$
2189 014626  000137  036660                JMP     @#FPSPUR        ;IF NOT THEN REPORT AN UNEXPECTED
2190                                                                ;FP TRAP.
2191 014632  170205                  1$:   STFPS   R5              ;GET FPS.
2192 014634  170303                        STST    R3              ;GET FEC.
2193 014636  022626                        CMP     (SP)+,(SP)+     ;RESET THE STACK.
2194
2195 014640  012704  100200                MOV     #100200,R4      ;EXPECTED FPS.
2196 014644  020405                        CMP     R4,R5           ;IS FPS CORRECT?
2197 014646  001040                        BNE     BBBER2          ;IF INCORRECT BRANCH.
2198
2199 014650  012702  000004                MOV     #4,R2           ;EXPECTED FEC.
2200 014654  020203                        CMP     R2,R3           ;IS FEC CORRECT?
2201 014656  001047                        BNE     BBBER3          ;IF INCORRECT BRANCH.
2202
2203 014660  000137  015110                JMP     @#BBBDONE       ;OTHERWISE GO TO NEXT TEST.
2204
2205
2206                              ;TRAP HERE IF AN UNEXPECTED INTERRUPT OCCURS.
2207 014664  062737  000002  001236 BBBER1: ADD     #2,@#$TMP2      ;SEE IF THE INTERRUPT OCCURRED
2208                                                                ;DURING THE EXECUTION OF THE DIVD
2209                                                                ;INSTRUCTION BEING TESTED.
2210 014672  021637  001236                CMP     (SP),@#$TMP2
2211 014676  001402                        BEQ     1$
2212 014700  000137  036660                JMP     @#FPSPUR        ;IF NOT REPORT UNEXPECTED FP TRAP.
2213
2214 014704  022626                  1$:   CMP     (SP)+,(SP)+     ;RESET THE STACK.
2215 014706  170303                        STST    R3              ;GET FEC.
2216 014710  170205                        STFPS   R5              ;GET FPS.
2217 014712  012737  000004  001240        MOV     #4,@#$TMP3      ;EXPECTED FEC.
2218 014720  010337  001242                MOV     R3,@#$TMP4
2219 014724  010537  001244                MOV     R5,@#$TMP5
2220 014730  010037  001250                MOV     R0,@#$TMP7
2221 014734  012737  140200  001246        MOV     #140200,@#$TMP6
2222 014742  104017                  2$:   ERROR   +17             ;REPORT (BUT FD) FAILED RESULTING IN AN FP TRAP
2223                                                                ;WITH TRAPS DISABLED.
2224 014744  000137  015110                JMP     @#BBBDONE
2225
2226                              ;REPORT FPS INCORRECT:
2227 014750  010537  001242          BBBER2: MOV     R5,@#$TMP4
2228 014754  010437  001244                MOV     R4,@#$TMP5
2229 014760  010037  001246                MOV     R0,@#$TMP6
2230 014764  010137  001250                MOV     R1,@#$TMP7
2231 014770  104020                  1$:   ERROR   +20
2232 014772  000137  015110                JMP     @#BBBDONE
2233
2234                              ;REPORT FEC INCORRECT:
2235 014776  010337  001242          BBBER3: MOV     R3,@#$TMP4
2236 015002  010237  001240                MOV     R2,@#$TMP3
```

```
 2237 015006  010037  001246                MOV     R0,@#$TMP6
 2238 015012  010137  001250                MOV     R1,@#$TMP7
 2239 015016  104021                1$:     ERROR   +21
 2240 015020  000137  015110                JMP     @#BBBDONE
 2241
 2242                                ;REPORT NO TRAP OCCURRED AFTER TRYING TO DIVIDE
 2243                                ;BY ZERO WITH ALL TRAPS ENABLED.
 2244 015024  170303                BBBER4: STST    R3              ;GET FEC.
 2245 015026  170205                        STFPS   R5              ;GET FPS.
 2246 015030  012737  000004  001242        MOV     #4,@#$TMP4
 2247 015036  010337  001240                MOV     R3,@#$TMP3
 2248 015042  010537  001244                MOV     R5,@#$TMP5
 2249 015046  012737  100200  001246        MOV     #100200,@#$TMP6
 2250 015054  010037  001250                MOV     R0,@#$TMP7
 2251 015060  010137  001252                MOV     R1,@#$TMP10
 2252 015064  104022                1$:     ERROR   +22
 2253 015066  000410                        BR      BBBDONE
 2254
 2255 015070  000000  000000  000000  BBBP1:  .WORD   0,0,0,0
      015076  000000
 2256 015100  012345  054321  023456  BBBP2:  .WORD   12345,54321,23456,76543
      015106  076543
 2257
 2258
 2259
 2260 015110                        BBBDONE:
      015110  104412                        RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                              ;SEE IF THE USER HAS EXPRESSED
                                              ;THE DESIRE TO CHANGE THE SOFTWARE
                                              ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                              ;THE USER TYPED CONTROL G?).
 2261
 2262
 2270
 2271                                ;;*****************************************************************
                                     ;*TEST 6        DIVF TEST
                                     ;*
                                     ;*THIS IS A TEST OF THE DIVF INSTRUCTION. NOTE THAT A SUBROUTINE IS
                                     ;*USED TO SET UP THE OPERANDS, EXECUTE THE INSTRUCTION AND CHECK THE
                                     ;*RESULTS.
                                     ;*
                                     ;;*****************************************************************
      015112  000004                 TST6:   SCOPE
 2272
 2273                                ;CHECK DIVF WITH (AC-0).
 2274 015114                         CCC1:
      015114  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2275 015116  004767  000552                JSR     PC,DIVFSUB
 2276 015122  000000  000000        1$:     .WORD   0,0             ;AC
 2277 015126  012345  067012        2$:     .WORD   12345,67012     ;FSRC
 2278 015132  000000  000000        3$:     .WORD   0,0             ;RES
 2279 015136  000000                4$:     0                       ;FPS BEFORE EXECUTION.
 2280 015140  000004                        4                       ;FPS AFTER EXECUTION
 2281 015142  012345  067012        5$:     .WORD   12345,67012     ;ERROR RESULT
 2282 015146  104023                6$:     ERRCR   +23             ;RESULT BAD.
 2283
 2284                                ;TEST DIVF WITH AC POSITIVE, FSRC POSITIVE AND IN ROUND MODE.
```

```
2285 015150                          CCC2:
     015150  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2286 015152  004737  015674                  JSR     PC,@#DIVFSUB
2287 015156  065652  125252          1$:     .WORD   65652,125252    ;AC
2288 015162  065600  000000          2$:     .WORD   65600,0         ;FSRC
2289 015166  040252  125252          3$:     .WORD   40252,125252    ;RES
2290 015172  003000                  4$:     3000                    ;FPS BEFORE EXECUTION.
2291 015174  003000                          3000                    ;FPS AFTER EXECUTION.
2292 015176  040052  125252          5$:     .WORD   40052,125252    ;ERROR RESULT.
2293 015202  104024                  6$:     ERROR   +24             ;DIV NORMALIZE FAILURE.
2294
2295                                 ;TEST DIVF WITH AC POSITIVE, FSRC POSITIVE.
2296 015204                          CCC3:
     015204  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2297 015206  004767  000462                  JSR     PC,DIVFSUB
2298 015212  076400  000000          1$:     .WORD   76400,0         ;AC
2299 015216  076400  000000          2$:     .WORD   76400,0         ;FSRC
2300 015222  040200  000000          3$:     .WORD   40200,0         ;RES
2301 015226  001000                  4$:     1000                    ;FPS BEFORE EXECUTION.
2302 015230  001000                          1000                    ;FPS AFTER EXECUTION.
2303 015232  140200  000000          5$:     .WORD   140200,0        ;ERROR RES.
2304
2305 015236  104025                  6$:     ERROR   +25             ;SIGN BAD.
2306
2307                                 ;TEST DIVF WITH BOTH OPERANDS POSITIVE.
2308 015240                          CCC4:
     015240  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2309 015242  004737  015674                  JSR     PC,@#DIVFSUB
2310 015246  056777  177777          1$:     .WORD   56777,177777    ;AC
2311 015252  054200  000000          2$:     .WORD   54200,0         ;FSRC
2312 015256  042777  177777          3$:     .WORD   42777,177777    ;RES
2313 015262  000000                  4$:     0                       ;FPS BEFORE EXECUTION.
2314 015264  000000                          0                       ;FPS AFTER EXECUTION.
2315 015266  002000  002000          5$:     .WORD   2000,2000       ;ERROR RES.
2316 015272  104023                  6$:     ERROR   +23
2317
2318                                 ;TEST THE DIVF INSTRUCTION:
2319 015274                          CCC5:
     015274  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2320 015276  004737  015674                  JSR     PC,@#DIVFSUB
2321 015302  012377  177777          1$:     .WORD   12377,177777    ;AC
2322 015306  012300  000000          2$:     .WORD   12300,0         ;FSRC
2323 015312  040252  125252          3$:     .WORD   40252,125252    ;RES
2324 015316  000000                  4$:     0                       ;FPS BEFORE EXECUTION.
2325 015320  000000                          0                       ;FPS AFTER EXECUTION.
2326 015322  177777  177777          5$:     .WORD   -1,-1           ;ERROR RES.
2327 015326  104023                  6$:     ERROR   +23
2328
2329                                 ;TEST DIVIDE ALGORITHM. TEST ROUND CONSTANT.
2330 015330                          CCC6:
     015330  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2331 015332  004737  015674                  JSR     PC,@#DIVFSUB
2332 015336  064600  000001          1$:     .WORD   64600,1         ;AC
2333 015342  066600  000000          2$:     .WORD   66600,0         ;FSRC
2334 015346  036200  000001          3$:     .WORD   36200,1         ;RES
2335 015352  000000                  4$:     0                       ;FPS BEFORE EXECUTION.
2336 015354  000000                          0                       ;FPS AFTER EXECUTION.
```

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 2337 015356  003000  003000          5$:     .WORD   3000,3000       ;ERROR RES.
 2338 015362  104023                  6$:     ERROR   +23
 2339
 2340                                 ;TEST DIVF.
 2341 015364                          CCC7:
      015364  104413                         LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2342 015366  004737  015674                 JSR     PC,@#DIVFSUB
 2343 015372  034577  177776          1$:     .WORD   34577,177776    ;AC
 2344 015376  023400  000000          2$:     .WORD   23400,0         ;FSRC
 2345 015402  051377  177776          3$:     .WORD   51377,177776    ;RES
 2346 015406  000017                  4$:     17                      ;FPS BEFORE EXECUTION.
 2347 015410  000000                          0                       ;FPS AFTER EXECUTION.
 2348 015412  003400  003400          5$:     .WORD   3400,3400       ;ERROR RES.
 2349 015416  104023                  6$:     ERROR   +23
 2350
 2351
 2352                                 ;DIVF TEST.
 2353 015420                          CCC8:
      015420  104413                         LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2354 015422  004737  015674                 JSR     PC,@#DIVFSUB
 2355 015426  067652  125252          1$:     .WORD   67652,125252    ;AC
 2356 015432  056500  000000          2$:     .WORD   56500,0         ;FSRC
 2357 015436  051343  107070          3$:     .WORD   51343,107070    ;RES
 2358 015442  000000                  4$:     0                       ;FPS BEFORE EXECUTION.
 2359 015444  000000                          0                       ;FPS AFTER EXECUTION.
 2360 015446  051543  107070          5$:     .WORD   51543,107070    ;ERROR RES.
 2361 015452  104026                  6$:     ERROR   +26             ;DIDN'T INCREMENT THE EXPONENT
 2362                                                                 ;AFTER DIVID NORMALIZATION.
 2363
 2364                                 ;DIVF WITH AC NEGATIVE, FSRC NEGATIVE.
 2365 015454                          CCC9:
      015454  104413                         LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2366 015456  004737  015674                 JSR     PC,@#DIVFSUB
 2367 015462  140400  000000          1$:     .WORD   140400,0        ;AC
 2368 015466  140500  000000          2$:     .WORD   140500,0        ;FSRC
 2369 015472  040052  125253          3$:     .WORD   040052,125253   ;RES
 2370 015476  000000                  4$:     0                       ;FPS BEFORE EXECUTION.
 2371 015500  000000                          0                       ;FPS AFTER EXECUTION.
 2372 015502  140052  125253          5$:     .WORD   140052,125253   ;ERROR RES.
 2373 015506  104027                  6$:     ERROR   +27             ;BAD SIGN.
 2374
 2375                                 ;DIVF WITH AC NEGATIVE AND FSRC POSITIVE.
 2376 015510                          CCC10:
      015510  104413                         LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2377 015512  004737  015674                 JSR     PC,@#DIVFSUB
 2378 015516  160077  000000          1$:     .WORD   160077,0        ;AC
 2379 015522  040277  000000          2$:     .WORD   40277,0         ;FSRC
 2380 015526  160000  000000          3$:     .WORD   160000,0        ;RES
 2381 015532  000007                  4$:     7                       ;FPS BEFORE EXECUTION.
 2382 015534  000010                          10                      ;FPS AFTER EXECUTION.
 2383 015536  060000  000000          5$:     .WORD   60000,0         ;ERROR RES.
 2384 015542  104027                  6$:     ERROR   +27             ;BAD SIGN.
 2385
 2386                                 ;DIVF WITH AC POSITIVE AND FSRC NEGATIVE.
 2387 015544                          CCC11:
      015544  104413                         LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2388 015546  004737  015674                 JSR     PC,@#DIVFSUB
```

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2369 015552  040400  000000          1$:     .WORD   40400,0          ;AC
2390 015556  140500  000000          2$:     .WORD   140500,0         ;FSRC
2391 015562  140052  125253          3$:     .WORD   140052,125253    ;RES
2392 015566  000017                  4$:     17                       ;FPS BEFORE EXECUTION.
2393 015570  000010                          10                       ;FPS AFTER EXECUTION.
2394 015572  040052  125253          5$:     .WORD   40052,125253     ;ERROR RES.
2395 015576  104027                  6$:     ERROR   +27              ;BAD SIGN.
2396
2397
2398                                  ;TEST DIVF BOTH OPERANDS POSITIVE AND TRUNCATE MODE.
2399 015600                          CCC12:
     015600  104413                          LPERR                    ;SET UP THE LOOP ON ERROR ADDRESS.
2400 015602  004737  015674                  JSR     PC,@#DIVFSUB
2401 015606  060100  000001          1$:     .WORD   60100,1          ;AC
2402 015612  040300  000000          2$:     .WORD   40300,0          ;FSRC
2403 015616  060000  000000          3$:     .WORD   60000,0          ;RES
2404 015622  000052                  4$:     52                       ;FPS BEFORE EXECUTION.
2405 015624  000040                          40                       ;FPS AFTER EXECUTION.
2406 015626  060000  000001          5$:     .WORD   60000,1          ;ERROR RES.
2407 015632  104030                  6$:     ERROR   +30              ;TRUNCATION ERROR
2408
2409                                  ;DIVF WITH POSITIVE OPERANDS AND ROUND MODE.
2410 015634                          CCC13:
     015634  104413                          LPERR                    ;SET UP THE LOOP ON ERROR ADDRESS.
2411 015636  004767  000032                  JSR     PC,DIVFSUB
2412 015642  060100  000001          1$:     .WORD   60100,1          ;AC
2413 015646  040300  000000          2$:     .WORD   40300,0          ;FSRC
2414 015652  060000  000001          3$:     .WORD   60000,1          ;RES
2415 015656  000005                  4$:     5                        ;FPS BEFORE EXECUTION.
2416 015660  000000                          0                        ;FPS AFTER EXECUTION.
2417 015662  060000  000000          5$:     .WORD   60000,0          ;ERROR RES.
2418 015666  104031                  6$:     ERROR   +31              ;ROUND ERROR.
2419
2420 015670  000137  016120                  JMP     @#CCCDONE        ;GO TO NEXT TEST.
2421
2422                                  ;THIS SUBROUTINE, DIVFSUB, IS CALLED TO SET UP, EXECUTE
2423                                  ;AND CHECK THE RESULT OF A DIVF INSTRUCTION. IT IS CALLED THUS:
2424                                  ;
2425                                  ;               JSR     PC,@#DIVFSUB
2426                                  ;       ACARG:  .WORD   X,X              ;AC OPERAND
2427                                  ;       FSRCARG:.WORD   X,X              ;FSRC OPERAND
2428                                  ;       RES:    .WORD   X,X              ;EXPECTED RESULT
2429                                  ;       FPSB:   .WORD   X                ;FPS BEFORE EXECUTION
2430                                  ;       FPSA:   .WORD   X                ;FPS AFTER EXECUTION
2431                                  ;       ERRES:  .WORD   X,X              ;ERROR RESULT
2432                                  ;       ERR:    ERROR   +X               ;RESULT ERROR
2433                                  ;       CONT:                            ;RETURN ADDRESS
2434                                  ;
2435                                  ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC OPERAND). THEN
2436                                  ;FPSB IS LOADED INTO THE FPS. THE INSTRUCTION, DIVF IS EXECUTED.
2437                                  ;AFTER THE EXECUTION THE RESULT IS CHECKED AGAINST THE
2438                                  ;EXPECTED CORRECT RESULT, RES. IF IT IS CORRECT THEN THE FPS
2439                                  ;IS CHECKED WITH THE EXPECTED CORRECT FPS, FPSA. IF THE FPS WAS
2440                                  ;INCORRECT THEN IT IS REPORTED. IF THE RESULT WAS INCORRECT IT
2441                                  ;IS COMPARED WITH ERRES IN AN ATTEMPT TO ANALYSE THE ERROR. IF
2442                                  ;THE INCORRECT RESULT MATCHED ERRES THEN CONTROL IS PASSED TO
2443                                  ;THE ERROR CALL AT ERR. IF THE INCORRECT RESULT DID NOT MATCH ERRES
```

```
                                        ;THEN THE FAILURE IS REPORTED IN DIVFSUB AND CONTROL IS PASSED TO
                                        ;CONT. IF NO ERRORS ARE DETECTED THEN DIVFSUB RETURNS CONTROL
                                        ;TO CONT.
                                        
015674  012601                  DIVFSUB:        MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
015676  012700  000200                  MOV     #200,R0         ;SET FD MODE.
015702  170100                  LDFPS   R0
015704  010100                  MOV     R1,R0           ;LOAD THE AC OPERAND.
015706  172410                  LDD     (R0),AC0
015710  016100  000014          MOV     14(R1),R0       ;LOAD THE FPS
015714  170100                  LDFPS   R0
015716  012737  015732  001236  MOV     #1$,@#$TMP2
015724  010100                  MOV     R1,R0
015726  062700  000004          ADD     #4,R0           ;ESTABLISH A POINTER TO FSRC.

015732  174410                  1$:     DIVF    (R0),AC0        ;TEST INSTRUCTION.

015734  170204                  STFPS   R4              ;GET THE FPS.
015736  012700  000200          MOV     #200,R0         ;SET FD MODE
015742  170100                  LDFPS   R0

015744  012700  016110          MOV     #DIVFT,R0       ;GET THE RESULT OF THE DIVF.
015750  174010                  STD     AC0,(R0)

015752  010102                  MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
015754  010237  001240          MOV     R2,@#$TMP3
015760  062702  000004          ADD     #4,R2
015764  010237  001242          MOV     R2,@#$TMP4
015770  062702  000004          ADD     #4,R2
015774  010237  001244          MOV     R2,@#$TMP5
016000  012737  016110  001246  MOV     #DIVFT,@#$TMP6
016006  010437  001250          MOV     R4,@#$TMP7
016012  016137  000016  001252  MOV     16(R1),@#$TMP10

016020  021061  000010          CMP     (R0),10(R1)     ;IS THE RESULT CORRECT?
016024  001011                  BNE     10$             ;IF INCORRECT BRANCH.
016026  026061  000002  000012  CMP     2(R0),12(R1)
016034  001005                  BNE     10$

016036  026104  000016          CMP     16(R1),R4       ;IS FPS CORRECT?
016042  001020                  BNE     15$             ;IF INCORRECT BRANCH.
016044  000161  000026          JMP     26(R1)          ;IF NO ERRORS OCCURRED RETURN.

016050  021061  000020          10$:    CMP     (R0),20(R1)     ;DOES THE INCORRECT RESULT
016054  001010                  BNE     11$             ;MATCH THE ANTICIPATED INCORRECT RESULT.
016056  026061  000002  000022  CMP     2(R0),22(R1)
016064  001004                  BNE     11$             ;BRANCH IF NO.

016066  010102                  MOV     R1,R2           ;IT MATCHED SO RETURN TO THE ERROR
                                                        ;REPORT AT THE CALLING ROUTINE.
016070  062702  000024          ADD     #24,R2
016074  000112                  JMP     (R2)

016076                          11$:                    ;REPORT RESULT INCORRECT.
016076  104023                  12$:    ERROR   +23
016100  000161  000026          13$:    JMP     26(R1)
```

```
2501 016104                          15$:                          ;REPORT FPS INCORRECT.
2502 016104  104032                  16$:    ERROR   +32
2503 016106  000774                          BR      13$
2504
2505 016110  000000  000000  000000  DIVFT:  .WORD   0,0,0,0
     016116  000000
2506
2507 016120                          CCCDONE:
     016120  104412                          RSETUP                ;GO INITIALIZE THE FPS AND STACK; AND
                                                                    ;SEE IF THE USER HAS EXPRESSED
                                                                    ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                    ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                    ;THE USER TYPED CONTROL G?).
2508
2509
2516
2517                                 ;;*****************************************************************
                                     ;*TEST 7        DIVD TEST
                                     ;*
                                     ;*THIS IS A TEST OF THE DIVD INSTRUCTION. NOTE THAT A SUBROUTINE IS
                                     ;*USED TO SET UP THE OPERANDS, EXECUTE THE INSTRUCTION AND CHECK THE RESULTS.
                                     ;*
                                     ;;*****************************************************************
     016122  000004                  TST7:   SCOPE
2518
2519                                 ;DIVD TEST WITH POSITIVE OPERANDS AND IN ROUND MODE.
2520 016124                          DDD1:
     016124  104413                          LPERR                 ;SET UP THE LOOP ON ERROR ADDRESS.
2521 016126  004737  016614                  JSR     PC,@#DIVDSUB
2522 016132  034277  000000  000000  1$:     .WORD   34277,0,0,0   ;AC
     016140  000000
2523 016142  040277  000000  000000  2$:     .WORD   40277,0,0,0   ;FSRC
     016150  000000
2524 016152  034200  000000  000000  3$:     .WORD   34200,0,0,0   ;RES
     016160  000000
2525 016162  000200                  4$:     200                   ;FPS BEFORE EXECUTION.
2526 016164  000200                          200                   ;FPS AFTER EXECUTION.
2527 016166  177777  177777  177777  5$:     .WORD   -1,-1,-1,-1   ;ERROR RES.
     016174  177777
2528 016176  104033                  6$:     ERROR   +33
2529
2530                                 ;DIVD WITH AC NEGATIVE AND FSRC POSITIVE IN TRUNCATE MODE.
2531 016200                          DDD2:
     016200  104413                          LPERR                 ;SET UP THE LOOP ON ERROR ADDRESS.
2532 016202  004737  016614                  JSR     PC,@#DIVDSUB
2533 016206  134277  000000  000000  1$:     .WORD   134277,0,0,0  ;AC
     016214  000000
2534 016216  040277  000000  000000  2$:     .WORD   40277,0,0,0   ;FSRC
     016224  000000
2535 016226  134200  000000  000000  3$:     .WORD   134200,0,0,0  ;RES
     016234  000000
2536 016236  000207                  4$:     207                   ;FPS BEFORE EXECUTION.
2537 016240  000210                          210                   ;FPS AFTER EXECUTION.
2538 016242  177777  177777  177777  5$:     .WORD   -1,-1,-1,-1   ;ERROR RESULT.
     016250  177777
2539 016252  104033                  6$:     ERROR   +33
2540
```

```
2541                                        ;DIVD TEST WITH OPERANDS BOTH NEGATIVE AND IN TRUNCATE MODE.
2542 016254                                 DDD3:
     016254  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2543 016256  004767  000332                        JSR     PC,DIVDSUB
2544 016262  134300  000000  000000  1$:         .WORD   134300,0,0,1    ;AC
     016270  000001
2545 016272  140300  000000  000000  2$:         .WORD   140300,0,0,0    ;FSRC
     016300  000000
2546 016302  034200  000000  000000  3$:         .WORD   34200,0,0,0     ;RES
     016310  000000
2547 016312  000250                  4$:         250                     ;FPS BEFORE EXECUTION.
2548 016314  000240                              240                     ;FPS AFTER EXECUTION.
2549 016316  034200  000000  000000  5$:         .WORD   34200,0,0,1     ;ERROR RES.
     016324  000001
2550 016326  104035                  6$:         ERROR   +35             ;TRUNCATION ERROR.
2551
2552                                        ;DIVD WITH AC POSITIVE AND FSRC NEGATIVE IN ROUND MODE.
2553 016330                                 DDD4:
     016330  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2554 016332  004737  016614                        JSR     PC,@#DIVDSUB
2555 016336  034300  000000  000000  1$:         .WORD   34300,0,0,1     ;AC
     016344  000001
2556 016346  140300  000000  000000  2$:         .WORD   140300,0,0,0    ;FSRC
     016354  000000
2557 016356  134200  000000  000000  3$:         .WORD   134200,0,0,1    ;RES
     016364  000001
2558 016366  000207                  4$:         207                     ;FPS BEFORE EXECUTION.
2559 016370  000210                              210                     ;FPS AFTER EXECUTION.
2560 016372  134200  000000  000000  5$:         .WORD   134200,0,0,0    ;ERROR RES.
     016400  000000
2561 016402  104036                  6$:         ERROR   +36             ;ROUND ERROR.
2562
2563                                        ;DIVD TEST.
2564 016404                                 DDD5:
     016404  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2565 016406  004737  016614                        JSR     PC,@#DIVDSUB
2566 016412  100400  000000  000000  1$:         .WORD   100400,0,0,0    ;AC
     016420  000000
2567 016422  000500  000000  000000  2$:         .WORD   500,0,0,0       ;FSRC
     016430  000000
2568 016432  140052  125252              3$:     .WORD   140052,125252   ;RES
2569 016436  125252  125252                      .WORD   125252,125252
2570 016442  007647                  4$:         7647                    ;FPS BEFORE EXECUTION.
2571 016444  007650                              7650                    ;FPS AFTER EXECUTION.
2572 016446  177777  177777  177777  5$:         .WORD   -1,-1,-1,-1     ;ERROR RES.
     016454  177777
2573 016456  104033                  6$:         ERROR   +33
2574
2575
2576                                        ;DIVD TEST WITH AC POSITIVE AND FSRC NEGATIVE IN ROUND MODE.
2577 016460                                 DDD6:
     016460  104413                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2578 016462  004737  016614                        JSR     PC,@#DIVDSUB
2579 016466  000400  000000  000000  1$:         .WORD   400,0,0,0       ;AC
     016474  000000
2580 016476  100500  000000  000000  2$:         .WORD   100500,0,0,0    ;FSRC
     016504  000000
```

```
2581 016506 140052 125252          3$:   .WORD   140052,125252   ;RES
2582 016512 125252 125253                .WORD   125252,125253
2583 016516 007707                 4$:   7707                    ;FPS BEFORE EXECUTION.
2584 016520 007710                       7710                    ;FPS AFTER EXECUTION.
2585 016522 177777 177777 177777  5$:   .WORD   -1,-1,-1,-1      ;ERROR RES.
     016530 177777
2586 016532 104033                 6$:   ERROR   +33
2587
2588                               ;DIVD TEST.
2589 016534                        DDD7:
     016534 104413                       LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2590 016536 004737 016614                JSR     PC,@#DIVDSUB
2591 016542 170360 170360          1$:   .WORD   170360,170360   ;AC
2592 016546 170360 170360                .WORD   170360,170360
2593 016552 170360 170360          2$:   .WORD   170360,170360   ;FSRC
2594 016556 170360 170360                .WORD   170360,170360
2595 016562 040200 000000 000000   3$:   .WORD   40200,0,0,0      ;RES
     016570 000000
2596 016572 007717                 4$:   7717                    ;FPS BEFORE EXECUTION.
2597 016574 007700                       7700                    ;FPS AFTER EXECUTION.
2598 016576 177777 177777 177777  5$:   .WORD   -1,-1,-1,-1      ;ERROR RES.
     016604 177777
2599 016606 104033                 6$:   ERROR   +33
2600
2601 016610 000137 017054                JMP     @#DDDDONE       ;GO TO NEXT TEST.
2602
2603
2604                               ;THIS SUBROUTINE, DIVDSUB, IS CALLED TO SET UP, EXECUTE
2605                               ;AND CHECK THE RESULT OF A DIVD INSTRUCTION. IT IS CALLED THUS:
2606                               ;
2607                               ;       JSR     PC,@#DIVDSUB
2608                               ;ACARG:  .WORD   X,X,X,X         ;AC OPERAND
2609                               ;FSRCARG:.WORD   X,X,X,X         ;FSRC OPERAND
2610                               ;RES:    .WORD   X,X,X,X         ;EXPECTED RESULT
2611                               ;FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
2612                               ;FPSA:   .WORD   X               ;FPS AFTER EXECUTION
2613                               ;ERRES:  .WORD   X,X,X,X         ;ERROR RESULT
2614                               ;ERR:    ERROR   +X              ;RESULT ERROR
2615                               ;CONT:                           ;RETURN ADDRESS
2616                               ;
2617                               ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC OPERAND). THEN
2618                               ;FPSB IS LOADED INTO THE FPS. THE INSTRUCTION, DIVD IS EXECUTED.
```

```
                                        ;AFTER THE EXECUTION THE RESULT IS CHECKED AGAINST THE
                                        ;EXPECTED CORRECT RESULT, RES. IF IT IS CORRECT THEN THE FPS
                                        ;IS CHECKED WITH THE EXPECTED CORRECT FPS, FPSA. IF THE FPS WAS
                                        ;INCORRECT THEN IT IS REPORTED. IF THE RESULT WAS INCORRECT IT
                                        ;IS COMPARED WITH ERRES IN AN ATTEMPT TO ANALYSE THE ERROR. IF
                                        ;THE INCORRECT RESULT MATCHED ERRES THEN CONTROL IS PASSED TO
                                        ;THE ERROR CALL AT ERR. IF THE INCORRECT RESULT DID NOT MATCH ERRES
                                        ;THEN THE FAILURE IS REPORTED IN DIVDSUB AND CONTROL IS PASSED TO
                                        ;CONT. IF NO ERRORS ARE DETECTED THEN DIVDSUB RETURNS CONTROL
                                        ;TO CONT.

016614  012601                  DIVDSUB:      MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
016616  012700  000200                MOV     #200,R0         ;SET FD MODE.
016622  170100                      LDFPS   R0

016624  010100                      MOV     R1,R0           ;SET UP THE AC0 OPERAND.
016626  172410                      LDD     (R0),AC0
016630  016100  000030              MOV     30(R1),R0       ;LOAD THE FPS.
016634  170100                      LDFPS   R0

016636  012737  016652  001236      MOV     #1$,@#$TMP2
016644  010100                      MOV     R1,R0           ;ESTABLISH A POINTER TO FSRC.
016646  062700  000010              ADD     #10,R0

016652  174410                  1$: DIVD    (R0),AC0        ;EXECUTE THE TEST INSTRUCTION.

016654  170204                      STFPS   R4              ;GET THE FPS.
016656  012700  000200              MOV     #200,R0         ;SET FD MODE.
016662  170100                      LDFPS   R0

016664  012700  017044              MOV     #DIVDT,RC       ;GET THE RESULT.
016670  174010                      STD     AC0,(R0)

016672  010102                      MOV     R1,R2           ;SAVE DATA IN CASE OF ERROR.
016674  010237  001240              MOV     R2,@#$TMP3
016700  062702  000010              ADD     #10,R2
016704  010237  001242              MOV     R2,@#$TMP4
016710  062702  000010              ADD     #10,R2
016714  010237  001244              MOV     R2,@#$TMP5
016720  012737  017044  001246      MOV     #DIVDT,@#$TMP6
016726  010437  001250              MOV     R4,@#$TMP7
016732  016137  000032  001252      MOV     32(R1),@#$TMP10

016740  010102                      MOV     R1,R2           ;CHECK THE RESULT.
016742  062702  000020              ADD     #20,R2
016746  012703  017044              MOV     #DIVDT,R3
016752  012705  000004              MOV     #4,R5
016756  022223                  2$: CMP     (R2)+,(R3)+
016760  001006                      BNE     10$             ;BRANCH IF RESULT INCORRECT.
016762  077503                      SOB     R5,2$

016764  026104  000032              CMP     32(R1),R4       ;IS FPS CORRECT?
016770  001023                      BNE     15$             ;BRANCH IF INCORRECT.
016772  000161  000046              JMP     46(R1)          ;RETURN.

016776  010102                  10$: MOV    R1,R2           ;WAS INCORRECT RESULT ANTICIPATED?
017000  062702  000034              ADD     #34,R2
```

```
 2677 017004  012703  017044                    MOV     #DIVDT,R3
 2678 017010  012705  000004                    MOV     #4,R5
 2679 017014  022223                  11$:      CMP     (R2)+,(R3)+
 2680 017016  001005                            BNE     12$             ;BRANCH IF NO.
 2681 017020  077503                            SOB     R5,11$
 2682 017022  010102                            MOV     R1,R2           ;IF THE INCORRECT RESULT WAS
 2683 017024  062702  000044                    ADD     #44,R2          ;ANTICIPATED RETURN TO THE
 2684                                                                   ;ERROR REPORT IN THE CALLING
 2685 017030  000112                            JMP     (R2)            ;ROUTINE.
 2686
 2687 017032                          12$:                              ;REPORT RESULT INCORRECT.
 2688 017032  104033                  13$:      ERROR   +33
 2689 017034  000161  000046          14$:      JMP     46(R1)
 2690
 2691 017040                          15$:                              ;REPORT FPS INCORRECT.
 2692 017040  104034                  16$:      ERROR   +34
 2693 017042  000774                            BR      14$
 2694
 2695 017044  000000  000000  000000  DIVDT:    .WORD   0,0,0,0
      017052  000000
 2696
 2697 017054                          DDDDONE:
      017054  104412                            RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                       ;SEE IF THE USER HAS EXPRESSED
                                                                       ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                       ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                       ;THE USER TYPED CONTROL G?).
 2698
 2699
 2707
 2708                                 ;;*****************************************************************
                                      ;*TEST 10       MULF TEST
                                      ;*
                                      ;*THIS IS A TEST OF THE MULF INSTRUCTION. IT MAKES USE OF A SUBROUTINE
                                      ;*TO SET UP THE OPERANDS, EXECUTE THE MULF INSTRUCTION AND CHECK THE
                                      ;*RESULTS.
                                      ;*
                                      ;;*****************************************************************
      017056  000004                  TST10:  SCOPE
 2709
 2710                                 ;MULF WITH (FSRC=AC-0)
 2711 017060                          EEE1:
      017060  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2712 017062  004737  017640                    JSR     PC,@#MULFSUB
 2713 017066  000000  000000          1$:       .WORD   0,0             ;AC
 2714 017072  000000  000000          2$:       .WORD   0,0             ;FSRC
 2715 017076  000000  000000          3$:       .WORD   0,0             ;RES
 2716 017102  007517                  4$:       7517                    ;FPS BEFORE EXECUTION.
 2717 017104  007504                            7504                    ;FPS AFTER EXECUTION.
 2718 017106  177777  177777          5$:       .WORD   -1,-1
 2719 017112  104037                  6$:       ERROR   +37
 2720
 2721                                 ;MULF WITH (FSRC=0).
 2722 017114                          EEE2:
      017114  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 2723 017116  004737  017640                    JSR     PC,@#MULFSUB
 2724 017122  071625  034435          1$:       .WORD   71625,34435     ;AC
```

```
2725 017126  000000  000000          2$:     .WORD   0,0             ;FSRC
2726 017132  000000  000000          3$:     .WORD   0,0             ;RES
2727 017136  000013                  4$:     13                      ;FPS BEFORE EXECUTION.
2728 017140  000004                          4                       ;FPS AFTER EXECUTION.
2729 017142  177777  177777          5$:     .WORD   -1,-1           ;ERROR RES.
2730 017146  104037                  6$:     ERROR   +37
2731
2732                                 ;MULF WITH (AC=0)
2733 017150                          EEE3:
     017150  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2734 017152  004737  017640                  JSR     PC,@#MULFSUB
2735 017156  000000  000000          1$:     .WORD   0,0             ;AC
2736 017162  071625  153443          2$:     .WORD   071625,153443   ;FSRC
2737 017166  000000  000000          3$:     .WORD   0,0             ;RES
2738 017172  007500                  4$:     7500                    ;FPS BEFORE EXECUTION.
2739 017174  007504                          7504                    ;FPS AFTER EXECUTION.
2740 017176  177777  177777          5$:     .WORD   -1,-1           ;ERROR RES.
2741 017202  104037                  6$:     ERROR   +37
2742
2743                                 ;MULF WITH AC POSITIVE AND FSRC POSITIVE IN ROUND MODE.
2744 017204                          EEE4:
     017204  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2745 017206  004737  017640                  JSR     PC,@#MULFSUB
2746 017212  040200  000000          1$:     .WORD   40200,0         ;AC
2747 017216  040177  177777          2$:     .WORD   40177,-1        ;FSRC
2748 017222  040177  177777          3$:     .WORD   40177,-1        ;RES
2749 017226  000017                  4$:     17                      ;FPS BEFORE EXECUTION.
2750 017230  000000                          0                       ;FPS AFTER EXECUTION.
2751 017232  140177  177777          5$:     .WORD   140177,-1       ;ERROR RES.
2752 017236  104041                  6$:     ERROR   +41             ;BAD SIGN.
2753
2754                                 ;MULF WITH AC POSITIVE AND FSRC POSITIVE IN TRUNCATE MODE.
2755 017240                          EEE5:
     017240  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2756 017242  004767  000372                  JSR     PC,MULFSUB
2757 017246  040177  177777          1$:     .WORD   40177,-1        ;AC
2758 017252  040200  000000          2$:     .WORD   40200,0         ;FSRC
2759 017256  040177  177777          3$:     .WORD   40177,-1        ;RES
2760 017262  000040                  4$:     40                      ;FPS BEFORE EXECUTION.
2761 017264  000040                          40                      ;FPS AFTER EXECUTION.
2762 017266  037777  177777          5$:     .WORD   37777,-1        ;ERROR RES.
2763 017272  104042                  6$:     ERROR   +42             ;ST 252 TO 044 INTO 444 (BUT Y62)
2764                                                                 ;MUL. NORMALIZATION FAILURE.
2765
2766                                 ;MULF WITH BOTH OPERANDS POSITIVE NORMALIZE TEST.
2767 017274                          EEE6:
     017274  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2768 017276  004737  017640                  JSR     PC,@#MULFSUB
2769 017302  040100  000000          1$:     .WORD   40100,0         ;AC
2770 017306  040100  000000          2$:     .WORD   40100,0         ;FSRC
2771 017312  040020  000000          3$:     .WORD   40020,0         ;RES
2772 017316  000012                  4$:     12                      ;FPS BEFORE EXECUTION.
2773 017320  000000                          0                       ;FPS AFTER EXECUTION.
2774 017322  042040  000000          5$:     .WORD   42040,0         ;ERROR RES.
2775 017326  104043                  6$:     ERROR   +43             ;ST 252 TO 444 INTO 042 (BUT Y62)
2776                                                                 ;MUL. NORMALIZATION FAILURE.
2777
```

```
                                        ;MULF WITH BOTH OPERANDS POSITIVE IN ROUND MODE.
2779 017330                             EEE7:
     017330  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2780 017332  004737  017640                    JSR     PC,@#MULFSUB
2781 017336  017500  000000            1$:     .WORD   17500,0         ;AC
2782 017342  023652  125252            2$:     .WORD   23652,125252    ;FSRC
2783 017346  003177  177777            3$:     .WORD   3177,-1         ;RES
2784 017352  007417                    4$:     7417                    ;FPS BEFORE EXECUTION.
2785 017354  007400                            7400                    ;FPS AFTER EXECUTION.
2786 017356  177777  177777            5$:     .WORD   -1,-1
2787 017362  104037                    6$:     ERROR   +37
2788
2789                                    ;MULF WITH AC POSITIVE AND FSRC NEGATIVE IN ROUND MODE.
2790 017364                             EEE8:
     017364  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2791 017366  004737  017640                    JSR     PC,@#MULFSUB
2792 017372  040342  000000            1$:     .WORD   40342,0         ;AC
2793 017376  176542  000000            2$.     .WORD   176542,0        ;FSRC
2794 017402  176707  102000            3$:     .WORD   176707,102000   ;RES
2795 017406  000007                    4$:     7                       ;FPS BEFORE EXECUTION.
2796 017410  000010                            10                      ;FPS AFTER EXECUTION.
2797 017412  076507  102000            7$:     .WORD   76507,102000    ;ERROR RES.
2798 017416  104041                    6$:     ERROR   +41             ;BAD SIGN.
2799
2800                                    ;MULF WITH AC NEGATIVE AND FSRC POSITIVE IN ROUND MODE.
2801 017420                             EEE9:
     017420  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2802 017422  004737  017640                    JSR     PC,@#MULFSUB
2803 017426  140200  000000            1$:     .WORD   140200,0        ;AC
2804 017432  007417  007417            2$:     .WORD   7417,7417       ;FSRC
2805 017436  107417  007417            3$:     .WORD   107417,7417     ;RES
2806 017442  000000                    4$:     0                       ;FPS BEFORE EXECUTION.
2807 017444  000010                            10                      ;FPS AFTER EXECUTION.
2808 017446  007417  007417            5$:     .WORD   7417,7417       ;ERROR RES.
2809 017452  104041                    6$:     ERROR   +41             ;BAD SIGN.
2810
2811                                    ;MULF WITH BOTH OPERANDS NEGATIVE IN ROUND MODE.
2812 017454                             EEE10:
     017454  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2813 017456  004737  017640                    JSR     PC,@#MULFSUB
2814 017462  144600  000000            1$:     .WORD   144600,0        ;AC
2815 017466  154000  000000            2$:     .WORD   154000,0        ;FSRC
2816 017472  060400  000000            3$:     .WORD   60400,0         ;RES
2817 017476  000017                    4$:     17                      ;FPS BEFORE EXECUTION.
2818 017500  000000                            0                       ;FPS AFTER EXECUTION.
2819 017502  160400  000000            5$:     .WORD   160400,0        ;ERROR RES.
2820 017506  104041                    6$:     ERROR   +41             ;BAD SIGN.
2821
2822                                    ;MULF BOTH OPERANDS NEGATIVE IN ROUND MODE.
2823 017510                             EEE11:
     017510  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2824 017512  004737  017640                    JSR     PC,@#MULFSUB
2825 017516  140300  000000            1$:     .WORD   140300,0        ;AC
2826 017522  160000  000001            2$:     .WORD   160000,1        ;FSRC
2827 017526  060100  000002            3$:     .WORD   60100,2         ;RES
2828 017532  000010                    4$:     10                      ;FPS BEFORE EXECUTION.
2829 017534  000000                            0                       ;FPS AFTER EXECUTION.
```

```
2830 017536  060100  000001          5$:     .WORD   60100,1         ;ERROR RES.
2831 017542  104044                  6$:     ERROR   +44             ;ROUND FAILURE.
2832
2833                                  ;MULF WITH AC POSITIVE AND FSRC NEGATIVE IN TRUNCATE MODE.
2834 017544                           EEE12:
     017544  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2835 017546  004737  017640                  JSR     PC,@#MULFSUB
2836 017552  060000  000001          1$:     .WORD   60000,1         ;AC
2837 017556  140300  000000          2$:     .WORD   140300,0        ;FSRC
2838 017562  160100  000001          3$:     .WORD   160100,1        ;RES
2839 017566  007547                  4$:     7547                    ;FPS BEFORE EXECUTION.
2840 017570  007550                          7550                    ;FPS AFTER EXECUTION.
2841 017572  160100  000001          5$:     .WORD   160100,1        ;ERROR RES.
2842 017576  104045                  6$:     ERROR   +45             ;TRUNCATION ERROR.
2843
2844                                  ;MULF WITH AC POSITIVE AND FSRC POSITIVE IN ROUND MODE.
2845 017600                           EEE13:
     017600  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2846 017602  004737  017640                  JSR     PC,@#MULFSUB
2847 017606  040277  000000          1$:     .WORD   40277,0         ;AC
2848 017612  060000  000001          2$:     .WORD   60000,1         ;FSRC
2849 017616  060077  000001          3$:     .WORD   60077,1         ;RES
2850 017622  000014                  4$:     14                      ;FPS BEFORE EXECUTION.
2851 017624  000000                          0                       ;FPS AFTER EXECUTION.
2852 017626  060077  000002          5$:     .WORD   60077,2         ;ERROR RES.
2853 017632  104044                  6$:     ERROR   +44             ;ROUND FAILURE. CONSTANT BAD.
2854
2855 017634  000167  000224                  JMP     EEEDONE         ;GO TO THE NEXT TEST.
2856
2857                                  ;THIS SUBROUTINE, MULFSUB, IS CALLED TO SET UP, EXECUTE
2858                                  ;AND CHECK THE RESULT OF A MULF INSTRUCTION. IT IS CALLED THUS:
2859                                  ;
2860                                  ;               JSR     PC,@#MULFSUB
2861                                  ;       ACARG:  .WORD   X,X             ;AC OPERAND
2862                                  ;       FSRCARG:.WORD   X,X             ;FSRC OPERAND
2863                                  ;       RES:    .WORD   X,X             ;EXPECTED RESULT
2864                                  ;       FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
2865                                  ;       FPSA:   .WORD   X               ;FPS AFTER EXECUTION
2866                                  ;       ERRES:  .WORD   X,X             ;ERROR RESULT
2867                                  ;       ERR:    ERROR   +X              ;RESULT ERROR
2868                                  ;       CONT:                           ;RETURN ADDRESS
2869                                  ;
2870                                  ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC OPERAND). THEN
2871                                  ;FPSB IS LOADED INTO THE FPS. THE INSTRUCTION, MULF IS EXECUTED.
2872                                  ;AFTER THE EXECUTION THE RESULT IS CHECKED AGAINST THE
2873                                  ;EXPECTED CORRECT RESULT, RES. IF IT IS CORRECT THEN THE FPS
2874                                  ;IS CHECKED WITH THE EXPECTED CORRECT FPS, FPSA. IF THE FPS WAS
2875                                  ;INCORRECT THEN IT IS REPORTED. IF THE RESULT WAS INCORRECT IT
2876                                  ;IS COMPARED WITH ERRES IN AN ATTEMPT TO ANALYSE THE ERROR. IF
2877                                  ;THE INCORRECT RESULT MATCHED ERRES THEN CONTROL IS PASSED TO
2878                                  ;THE ERROR CALL AT ERR. IF THE INCORRECT RESULT DID NOT MATCH ERRES
2879                                  ;THEN THE FAILURE IS REPORTED IN MULFSUB AND CONTROL IS PASSED TO
2880                                  ;CONT. IF NO ERRORS ARE DETECTED THEN MULFSUB RETURNS CONTROL
2881                                  ;TO CONT.
2882
2883 017640  012601                  MULFSUB:        MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
2884 017642  012700  000200                  MOV     #200,R0         ;SET FD MODE.
```

```
2885 017646  170100                        LDFPS   R0
2886 017650  010100                        MOV     R1,R0           ;LOAD THE AC OPERAND.
2887 017652  172410                        LDD     (R0),AC0
2888 017654  016100  000014                MOV     14(R1),R0       ;LOAD THE FPS
2889 017660  170100                        LDFPS   R0
2890 017662  012737  017676  001236        MOV     #1$,@#$TMP2
2891 017670  010100                        MOV     R1,R0
2892 017672  062700  000004                ADD     #4,R0           ;ESTABLISH A POINTER TO FSRC.
2893
2894 017676  171010              1$:       MULF    (R0),AC0        ;TEST INSTRUCTION.
2895
2896 017700  170204                        STFPS   R4              ;GET THE FPS.
2897 017702  012700  000200                MOV     #200,R0         ;SET FD MODE
2898 017706  170100                        LDFPS   R0
2899
2900 017710  012700  020054                MOV     #MULFT,R0       ;GET THE RESULT OF THE MULF.
2901 017714  174010                        STD     AC0,(R0)
2902
2903 017716  010102                        MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
2904 017720  010237  001240                MOV     R2,@#$TMP3
2905 017724  062702  000004                ADD     #4,R2
2906 017730  010237  001242                MOV     R2,@#$TMP4
2907 017734  062702  000004                ADD     #4,R2
2908 017740  010237  001244                MOV     R2,@#$TMP5
2909 017744  012737  020054  001246        MOV     #MULFT,@#$TMP6
2910 017752  010437  001250                MOV     R4,@#$TMP7
2911 017756  016137  000016  001252        MOV     16(R1),@#$TMP10
2912
2913 017764  021061  000010                CMP     (R0),10(R1)     ;IS THE RESULT CORRECT?
2914 017770  001011                        BNE     10$             ;IF INCORRECT BRANCH.
2915 017772  026061  000002  000012        CMP     2(R0),12(R1)
2916 020000  001005                        BNE     10$
2917
2918 020002  026104  000016                CMP     16(R1),R4       ;IS FPS CORRECT?
2919 020006  001020                        BNE     15$             ;IF INCORRECT BRANCH.
2920 020010  000161  000026                JMP     26(R1)          ;IF NO ERRORS OCCURRED RETURN.
2921
2922 020014  021061  000020        10$:    CMP     (R0),20(R1)     ;DOES THE INCORRECT RESULT
2923 020020  001010                        BNE     11$             ;MATCH THE ANTICIPATED INCORRECT RESULT.
2924 020022  026061  000002  000022        CMP     2(R0),22(R1)
2925 020030  001004                        BNE     11$             ;BRANCH IF NO.
2926
2927 020032  010102                        MOV     R1,R2           ;IT MATCHED SO RETURN TO THE ERROR
2928                                                               ;REPORT AT THE CALLING ROUTINE.
2929 020034  062702  000024                ADD     #24,R2
2930 020040  000112                        JMP     (R2)
2931
2932 020042                      11$:                              ;REPORT RESULT INCORRECT.
2933 020042  104037              12$:      ERROR   +37
2934 020044  000161  000026      13$:      JMP     26(R1)
2935
2936 020050                      15$:                              ;REPORT FPS INCORRECT.
2937 020050  104040              16$:      ERROR   +40
2938 020052  000774                        BR      13$
2939
2940 020054  000000  000000  000000  MULFT:  .WORD   0,0,0,0
     020062  000000
```

```
                                FEEDONE:
020064  104412                          RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                ;SEE IF THE USER HAS EXPRESSED
                                                                ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                ;THE USER TYPED CONTROL G?).

                                ;;*****************************************************************
                                ;*TEST 11       MULD TEST
                                ;*
                                ;*THIS IS A TEST OF THE MULD INSTRUCTION. NOTE THAT A SUBROUTINE IS
                                ;*USED TO SET UP THE OPERANDS, EXECUTE THE MULD INSTRUCTION AND
                                ;*CHECK THE RESULTS.
                                ;*
                                ;;*****************************************************************
020066  000004                  TST11:  SCOPE

                                ;MULD TEST WITH AC POSITIVE AND FSRC POSITIVE.
020070                          FFF1:
020070  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
020072  004737  020354                  JSR     PC,@#MULDSUB
020076  040200  000000  000000  1$:     .WORD   40200,0,0,0     ;AC
020104  000000
020106  023777  177777  177777  2$:     .WORD   23777,-1,-1,-1  ;FSRC
020114  177777
020116  023777  177777  177777  3$:     .WORD   23777,-1,-1,-1  ;RES
020124  177777
020126  000217                  4$:     217                     ;FPS BEFORE EXECUTION.
020130  000200                          200                     ;FPS AFTER ECECUTION.
020132  023777  177777  000000  5$:     .WORD   23777,-1,0,0    ;ERROR RES.
020140  000000
020142  104047                  6$:     ERROR   +47             ;BAD CONSTANT USED IN ALGORITHM
                                                                ;USED 24 INSTEAD OF 56.

                                ;MULD TEST WITH BOTH OPERANDS POSITIVE TRUNCATION TEST.
020144                          FFF2:
020144  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
020146  004767  000202                  JSR     PC,MULDSUB
020152  065400  000000  000000  1$:     .WORD   65400,0,0,1     ;AC
020160  000001
020162  037577  177777  177777  2$:     .WORD   37577,-1,-1,-2  ;FSRC
020170  177776
020172  064777  177777  177777  3$:     .WORD   64777,-1,-1,-1  ;RES
020200  177777
020202  000247                  4$:     247                     ;FPS BEFORE EXECUTION.
020204  000240                          240                     ;FPS AFTER EXECUTION.
020206  065000  000000  000000  5$:     .WORD   65000,0,0,0     ;ERROR RES.
020214  000000
020216  104050                  6$:     ERROR   +50             ;TRUNCATION ERROR.

                                ;MULD TEST WITH BOTH OPERANDS NEGATIVE IN ROUND MODE.
020220                          FFF3:
020220  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
020222  004737  020354                  JSR     PC,@#MULDSUB
```

```
2981 020226  137577  177777  177777  1$:     .WORD   137577,-1,-1,-2 ;AC
     020234  177776
2982 020236  165400  000000  000000  2$:     .WORD   165400,0,0,1    ;FSRC
     020244  000001
2983 020246  065000  000000  000000  3$:     .WORD   65000,0,0,0     ;RES
     020254  000000
2984 020256  007717                  4$:     7717                    ;FPS BEFORE EXECUTION.
2985 020260  007700                          7700                    ;FPS AFTER EXECUTION.
2986 020262  064777  177777  177777  5$:     .WORD   64777,-1,-1,-1  ;ERROR RES.
     020270  177777
2987 020272  104051                  6$:     ERROR   +51             ;ROUND ERROR.
2988
2989                                 ;MULD   TEST WITH AC POSITIVE AND FSRC NEGATIVE IN ROUND MODE.
2990 020274                          FFF4:
     020274  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
2991 020276  004737  020354                  JSR     PC,@#MULDSUB
2992 020302  017500  000000  000000  1$:     .WORD   17500,0,0,0     ;AC
     020310  000000
2993 020312  123652  125252          2$:     .WORD   123652,125252   ;FSRC
2994 020316  125252  125252                  .WORD   125252,125252
2995 020322  103177  177777  177777  3$:     .WORD   103177,-1,-1,-1 ;RES
     020330  177777
2996 020332  000200                  4$:     200                     ;FPS BEFORE EXECUTION.
2997 020334  000210                          210                     ;FPS AFTER EXECUTION.
2998 020336  103200  000000  000000  5$:     .WORD   103200,0,0,0    ;ERROR RES.
     020344  000000
2999 020346  104052                  6$:     ERROR   +52             ;ROUND ERROR (BAD CONSTANT).
3000
3001 020350  000167  000240                  JMP     FFFDONE
3002
3003                                 ;THIS SUBROUTINE, MULDSUB, IS CALLED TO SET UP, EXECUTE
3004                                 ;AND CHECK THE RESULT OF A MULD INSTRUCTION. IT IS CALLED THUS:
3005                                 ;
3006                                 ;               JSR     PC,@#MULDSUB
3007                                 ;       ACARG:  .WORD   X,X,X,X         ;AC OPERAND
3008                                 ;       FSRCARG:.WORD   X,X,X,X         ;FSRC OPERAND
3009                                 ;       RES:    .WORD   X,X,X,X         ;EXPECTED RESULT
3010                                 ;       FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
3011                                 ;       FPSA:   .WORD   X               ;FPS AFTER EXECUTION
3012                                 ;       ERRES:  .WORD   X,X,X,X         ;ERROR RESULT
3013                                 ;       ERR:    ERROR   +X              ;RESULT ERROR
3014                                 ;       CONT:                           ;RETURN ADDRESS
3015                                 ;
3016                                 ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC OPERAND). THEN
3017                                 ;FPSB IS LOADED INTO THE FPS. THE INSTRUCTION, MULD IS EXECUTED.
3018                                 ;AFTER THE EXECUTION THE RESULT IS CHECKED AGAINST THE
3019                                 ;EXPECTED CORRECT RESULT, RES. IF IT IS CORRECT THEN THE FPS
3020                                 ;IS CHECKED WITH THE EXPECTED CORRECT FPS, FPSA. IF THE FPS WAS
3021                                 ;INCORRECT THEN IT IS REPORTED. IF THE RESULT WAS INCORRECT IT
3022                                 ;IS COMPARED WITH ERRES IN AN ATTEMPT TO ANALYSE THE ERROR. IF
3023                                 ;THE INCORRECT RESULT MATCHED ERRES THEN CONTROL IS PASSED TO
3024                                 ;THE ERROR CALL AT ERR. IF THE INCORRECT RESULT DID NOT MATCH ERRES
3025                                 ;THEN THE FAILURE IS REPORTED IN MULDSUB AND CONTROL IS PASSED TO
3026                                 ;CONT. IF NO ERRORS ARE DETECTED THEN MULDSUB RETURNS CONTROL
3027                                 ;TO CONT.
3028
3029 020354  012601                  MULDSUB:        MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
```

```
3030 020356  012700  000200                    MOV     #200,R0          ;SET FD MODE.
3031 020362  170100                            LDFPS   R0
3032
3033 020364  010100                            MOV     R1,R0            ;SET UP THE AC0 OPERAND.
3034 020366  172410                            LDD     (R0),AC0
3035 020370  016100  000030                    MOV     30(R1),R0        ;LOAD THE FPS.
3036 020374  170100                            LDFPS   R0
3037
3038 020376  012737  020412  001236            MOV     #1$,@#$TMP2
3039 020404  010100                            MOV     R1,R0            ;ESTABLISH A POINTER TO FSRC.
3040 020406  062700  000010                    ADD     #10,R0
3041
3042 020412  171010                  1$:       MULD    (R0),AC0         ;EXECUTE THE TEST INSTRUCTION.
3043
3044 020414  170204                            STFPS   R4               ;GET THE FPS.
3045 020416  012700  000200                    MOV     #200,R0          ;SET FD MODE.
3046 020422  170100                            LDFPS   R0
3047
3048 020424  012700  020604                    MOV     #MULDT,R0        ;GET THE RESULT.
3049 020430  174010                            STD     AC0,(R0)
3050
3051 020432  010102                            MOV     R1,R2            ;SAVE DATA IN CASE OF ERROR.
3052 020434  010237  001240                    MOV     R2,@#$TMP3
3053 020440  062702  000010                    ADD     #10,R2
3054 020444  010237  001242                    MOV     R2,@#$TMP4
3055 020450  062702  000010                    ADD     #10,R2
3056 020454  010237  001244                    MOV     R2,@#$TMP5
3057 020460  012737  020604  001246            MOV     #MULDT,@#$TMP6
3058 020466  010437  001250                    MOV     R4,@#$TMP7
3059 020472  016137  000032  001252            MOV     32(R1),@#$TMP10
3060
3061 020500  010102                            MOV     R1,R2            ;CHECK THE RESULT.
3062 020502  062702  000020                    ADD     #20,R2
3063 020506  012703  020604                    MOV     #MULDT,R3
3064 020512  012705  000004                    MOV     #4,R5
3065 020516  022223                  2$:       CMP     (R2)+,(R3)+
3066 020520  001006                            BNE     10$              ;BRANCH IF RESULT INCORRECT.
3067 020522  077503                            SOB     R5,2$
3068
3069 020524  026104  000032                    CMP     32(R1),R4        ;IS FPS CORRECT?
3070 020530  001023                            BNE     15$              ;BRANCH IF INCORRECT.
3071 020532  000161  000046                    JMP     46(R1)           ;RETURN.
3072
3073 020536  010102                  10$:      MOV     R1,R2            ;WAS INCORRECT RESULT ANTICIPATED?
3074 020540  062702  000034                    ADD     #34,R2
3075 020544  012703  020604                    MOV     #MULDT,R3
3076 020550  012705  000004                    MOV     #4,R5
3077 020554  022223                  11$:      CMP     (R2)+,(R3)+
3078 020556  001005                            BNE     12$              ;BRANCH IF NO.
3079 020560  077503                            SOB     R5,11$
3080 020562  010102                            MOV     R1,R2            ;IF THE INCORRECT RESULT WAS
3081 020564  062702  000044                    ADD     #44,R2           ;ANTICIPATED RETURN TO THE
3082                                                                    ;ERROR REPORT IN THE CALLING
3083 020570  000112                            JMP     (R2)             ;ROUTINE.
3084
3085 020572                        12$:                                 ;REPORT RESULT INCORRECT.
3086 020572  104246                13$:      ERROR   +246
```

```
 3087 020574  000161  000046          14$:    JMP     46(R1)
 3088
 3089 020600                          15$:                            ;REPORT FPS INCORRECT.
 3090 020600  104046                  16$:    ERROR   +46
 3091 020602  000774                          BR      14$
 3092
 3093 020604  000000  000000  000000  MULDT:  .WORD   0,0,0,0
      020612  000000
 3094
 3095 020614                          FFFDONE:
      020614  104412                          RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                      ;SEE IF THE USER HAS EXPRESSED
                                                                      ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                      ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                      ;THE USER TYPED CONTROL G?).
 3096
 3097
 3106
 3107                                         ;TEST TITLE:UNDER/OVERFLOW, USING MULF WITH TRAPS DISABLED
 3108                                 ;;*********************************************************************
                                      ;*TEST 12       SEE COMMENT ABOVE FOR TEST TITLE
                                      ;*
                                      ;*THIS IS A TEST OF THE OVERFLOW AND UNDERFLOW CONDITIONS USING
                                      ;*THE MULF INSTRUCTION WITH TRAPS DISABLED. NOTE THAT A SUBROUTINE
                                      ;*IS USED TO SET UP THE OPERANDS, EXECUTE THE MULF INSTRUCTION AND
                                      ;*CHECK THE RESULTS.
                                      ;*
                                      ;;*********************************************************************
      020616  000004                  TST12:  SCOPE
 3109
 3110                                 ;UNDERFLOW, WITH EXPONENT OF RESULT = -129
 3111 020620                          IIII:
      020620  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 3112 020622  004737  021044                  JSR     PC,@#OVUNFNT
 3113 020626  020200  000000          1$:     .WORD   20200,0         ;AC
 3114 020632  020000  000000          2$:     .WORD   20000,0         ;FSRC
 3115 020636  000000  000000          3$:     .WORD   0,0             ;RES
 3116 020642  177777  177777          4$:     .WORD   -1,-1           ;ERROR RES.
 3117 020646  000000                  5$:     0                       ;FPS BEFORE EXECUTION.
 3118 020650  000004                          4                       ;FPS AFTER EXECUTION.
 3119 020652  000012                  6$:     12                      ;FEC
 3120 020654  177777                          -1                      ;FLAG
 3121 020656  104117                  7$:     ERROR   +117            ;ST 331 TO 155 INTO 115 (BUT FIU)
 3122 020660  000401                          BR      8$
 3123 020662  104114                          ERROR   +114
 3124 020664                          8$:
 3125
 3126                                 ;UNDERFLOW, WITH EXPONENT OF RESULT = -193
 3127 020664                          III2:
      020664  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 3128 020666  004737  021044                  JSR     PC,@#OVUNFNT
 3129 020672  010200  000000          1$:     .WORD   10200,0         ;AC
 3130 020676  010000  000000          2$:     .WORD   10000,0         ;FSRC
 3131 020702  000000  000000          3$:     .WORD   0,0             ;RES
 3132 020706  010000  000000          4$:     .WORD   10000,0         ;ERROR RES.
 3133 020712  005013                  5$:     5013                    ;FPS BEFORE EXECUTION.
 3134 020714  005004                          5004                    ;FPS AFTER EXECUTION.
```

```
3135 020716 000012                  6$:     12                      ;FEC
3136 020720 177777                          -1                      ;FLAG
3137 020722 104120                  7$:     ERROR   +120            ;SETTING FIUV OR FIV CAUSES TRAP
3138                                                                ;WITH FIU CLEAR.
3139 020724 000401                          BR      8$
3140 020726 104114                          ERROR   +114
3141 020730                         8$:
3142
3143                                ;OVERFLOW, EXPONENT OF RESULT = 128
3144 020730                         III3:
     020730 104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
3145 020732 004737 021044                   JSR     PC,@#OVUNFNT
3146 020736 060200 00000C           1$:     .WORD   60200,0         ;AC
3147 020742 060000 000000           2$:     .WORD   60000,0         ;FSRC
3148 020746 000000 000000           3$:     .WORD   0,0             ;RES
3149 020752 060000 000000           4$:     .WORD   60000,0         ;ERROR RES.
3150 020756 000000                  5$:     0                       ;FPS BEFORE EXECUTION.
3151 020760 000006                          6                       ;FPS AFTER EXECUTION.
3152 020762 000010                  6$:     10                      ;FEC
3153 020764 000000                          0                       ;FLAG
3154 020766 104121                  7$:     ERROR   +121            ;ST 333 TO 136 INTO 116 (BUT FIV).
3155 020770 000401                          BR      8$
3156 020772 104113                          ERROR   +113
3157 020774                         8$:
3158
3159                                ;OVERFLOW, EXPONENT OF RESULT - 130
3160 020774                         III4:
     020774 104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
3161 020776 004737 021044                   JSR     PC,@#OVUNFNT
3162 021002 060200 000000           1$:     .WORD   60200,0         ;AC
3163 021006 060200 000000           2$:     .WORD   60200,0         ;FSRC
3164 021012 000000 000000           3$:     .WORD   0,0             ;RES
3165 021016 177777 177777           4$:     .WORD   -1,-1           ;ERROR RES.
3166 021022 006011                  5$:     6011                    ;FPS BEFORE EXECUTION.
3167 021024 006006                          6006                    ;FPS AFTER EXECUTION.
3168 021026 000010                  6$:     10                      ;FEC
3169 021030 000000                          0                       ;FLAG
3170 021032 104122                  7$:     ERROR   +122            ;SETTING FIUV OR FIU WITH
3171                                                                ;FIV CLEAR CAUSES TRAP.
3172 021034 000401                          BR      8$
3173 021036 104113                          ERROR   +113
3174 021040 000167 000410           8$:     JMP     IIIDONE         ;GO TO NEXT TEST.
3175
3176
3177
3178                                ;THIS SUBROUTINE, OVUNFNT, IS USED TO SET UP THE OPERANDS, EXECUTE
3179                                ;THE MULF INSTRUCTION AND CHECK THE RESULTS OF AN INSTRUCTION WITH
3180                                ;OPERANDS WHICH SHOULD RESULT IN EITHER OVERFLOW OR UNDERFLOW. A CALL
3181                                ;TO IT IS MADE THUS:
3182                                ;
3183                                ;               ACARG:  .WORD   X,X             ;AC OPERAND
3184                                ;               FSRCARG:.WORD   X,X             ;FSRC OPERAND
3185                                ;               RES:    .WORD   X,X             ;EXPECTED RESULT
3186                                ;               ERRES:  .WORD   X,X             ;ERROR RESULT
3187                                ;               FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
3188                                ;               FPSA:   .WORD   X               ;FPS AFTER EXECUTION
3189                                ;               FEC:    .WORD   X               ;EXPECTED FEC
```

```
                                ;              FLAG:   .WORD   X               ;0/-1,OVER/UNDER FLOW FLAG
                                ;              ERR1:   ERROR   +X              ;TRAP ERROR.
                                ;              BR      CONT
                                ;              ERR2:   ERROR   +X              ;DATA, RESULT ERROR
                                ;              CONT:                           ;RETURN ADDRESS
                                ;
                                ;THE OPERANDS ARE SET UP (USING AC0 AS THE ACCUMULATOR). THEN
                                ;THE MULF INSTRUCTION IS EXECUTED. IF NO TRAP OCCURS THEN THE
                                ;RESULT IS CHECKED AGAINST RES. IF THE RESULT IS CORRECT THEN THE FPS IS
                                ;COMPARED WITH FPSA IF THIS TOO IS CORRECT OVUNFNT RETURNS CONTROL
                                ;TO THE CALLING ROUTINE AT CONT. IF THE FPS IS BAD OVUNFNT
                                ;REPORTS THIS FAILURE AND THEN RETURNS TO CONT. IF THE RESULT OF THE
                                ;MULF IS INCORRECT, THE INCORRECT RESULT IS COMPARED WITH THE
                                ;ANTICIPATED FAILING DATA PATTERN, ERRES. IF THE FAILURE IN
                                ;THE RESULT WAS ANTICIPATED CORRECTLY TO BE ERRES THEN OVUNFNT
                                ;WILL TRANSFER CONTROL TO THE ERROR CALL AT ERR2. OTHERWISE THE
                                ;RESULT WAS INCORRECT BUT WAS NOT ANTICIPATED AND OVUNFNT WILL
                                ;REPORT THE FAILURE AFTER WHICH CONTROL WILL BE PASSED TO CONT.
                                ;IF A TRAP OCCURS (IT SHOULD NOT) THEN OVUNFNT WILL READ THE FEC.
                                ;SHOULD THE FEC MATCH THE ANTICIPATED FEC OVUNFNT WILL
                                ;STORE ALL DATA AND TRANSFER CONTROL TO THE ERROR CALL AT ERR1. IF THE
                                ;FEC IS NOT THE SAME AS THE ANTICIPATED FEC OVUNFNT WILL REPORT
                                ;THE ERROR AND RETURN TO CONT. NOTE THAT OVUNFNT USES THE FLAG
                                ;TO TELL WHETHER OR NOT THESE PARTICULAR OPERANDS WILL RESULT IN
                                ;UNDERFLOW (FLAG=-1) OR OVERFLOW (FLAG=0).

021044  012601                  OVUNFNT:        MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
021046  012700  000200                  MOV     #200,R0         ;SET FD MODE.
021052  170100                  LDFPS   R0

021054  010100                  MOV     R1,R0           ;LOAD AC0, OPERAND.
021056  172410                  LDD     (R0),AC0

021060  010102                  MOV     R1,R2           ;SAVE THE DATA PATTERNS IN CASE OF
021062  010237  001240          MOV     R2,@#$TMP3      ;ERROR.
021066  062702  000004          ADD     #4,R2
021072  010237  001242          MOV     R2,@#$TMP4
021076  062702  000004          ADD     #4,R2
021102  010237  001244          MOV     R2,@#$TMP5
021106  016137  000022  001252  MOV     22(R1),@#$TMP10
021114  012737  021444  001246  MOV     #OVFNTT,@#$TMP6

021122  016100  000020          MOV     20(R1),R0       ;LOAD THE FPS.
021126  170100                  LDFPS   R0
021130  012737  021152  001236  MOV     #1$,@#$TMP2
021136  012737  021336  000244  MOV     #25$,@#FPVECT   ;SET UP THE FP TRAP VECTOR IN CASE
                                                        ;OF ERROR.
021144  010100                  MOV     R1,R0           ;COMPUTE THE ADDRESS OF FSRC.
021146  062700  000004          ADD     #4,R0

021152  171010          1$:     MULF    (R0),AC0        ;TEST INSTRUCTION.

021154  170204          2$:     STFPS   R4              ;GET FPS.
021156  170305                  STST    R5              ;GET FEC.
021160  012700  000200          MOV     #200,R0         ;SET FD MODE.
021164  170100                  LDFPS   R0
021166  012700  021444          MOV     #OVFNTT,R0      ;GET THE RESULT.
```

```
3247 021172  174010                        STD     AC0,(R0)
3248 021174  010437  001250                MOV     R4,@#$TMP7
3249 021200  010537  001254                MOV     R5,@#$TMP11
3250
3251 021204  012700  021444                MOV     #OVFNTT,R0      ;CHECK THE RESULT.
3252 021210  010102                        MOV     R1,R2
3253 021212  062702  000010                ADD     #10,R2
3254 021216  012703  000002                MOV     #2,R3
3255 021222  022022              3$:       CMP     (R0)+,(R2)+
3256 021224  001015                        BNE     15$             ;BRANCH IF INCORRECT.
3257 021226  077303                        SOB     R3,3$
3258
3259 021230  026104  000022                CMP     22(R1),R4       ;WAS FPS CORRECT?
3260 021234  001002                        BNE     10$             ;BRANCH IF FPS IS INCORRECT.
3261
3262 021236  000161  000036          4$:   JMP     36(R1)          ;RETURN, TEST COMPLETED.
3263
3264                                  ;REPORT INCORRECT FPS.
3265 021242  005761  000026          10$:  TST     26(R1)          ,WAS THE RESULT OVER OR UNDER FLOW?
3266 021246  001002                        BNE     12$             ;BRANCH IF UNDERFLOW.
3267
3268                                                              ;REPORT FPS BAD AFTER OVERFLOW.
3269 021250  104111                  11$:  ERROR   +111
3270 021252  000771                        BR      4$
3271
3272 021254                          12$:                          ;REPORT FPS BAD AFTER UNDERFLOW.
3273 021254  104112                  13$:  ERROR   +112
3274 021256  000767                        BR      4$
3275
```

```
                                        ;RESULT INCORRECT.
021260  012700  021444          15$:    MOV     #OVFNTT,R0      ;SEE IF FAILURE IS ANTICIPATED
021264  010102                          MOV     R1,R2           ;FAILURE.
021266  062702  000014                  ADD     #14,R2
021272  012703  000002                  MOV     #2,R3
021276  022022                  16$:    CMP     (R0)+,(R2)+
021300  001007                          BNE     17$             ;BRANCH IF NOT ANTICIPATED.
021302  077303                          SOB     R3,16$
                                        
021304  010102                          MOV     R1,R2           ;ERROR WAS ANTICIPATED SO RETURN
021306  062702  000034                  ADD     #34,R2          ;TO THE ERROR REPORT IN THE CALLING
021312  010237  001236                  MOV     R2,@#$TMP2      ;ROUTINE.
021316  000112                          JMP     (R2)
                                        
021320  005761  000026          17$:    TST     26(R1)          ;RESULT WAS NOT ANTICIPATED
                                                                ;SO ERROR MUST BE REPORTED HERE.
                                                                ;FIRST SEE IF ARGUMENTS SHOULD
                                                                ;HAVE RESULTED IN OVERFLOW OR UNDER
                                                                ;FLOW BY LOOKING AT THE FLAG.
021324  001002                          BNE     19$             ;BRANCH IF UNDERFLOW EXPECTED.
                                        
                                                                ;REPORT RESULT INCORRECT, EXPECTING
021326  104113                  18$:    ERROR   +113            ;OVERFLOW.
021330  000742                          BR      4$
                                        
021332                          19$:                            ;REPORT RESULT INCORRECT, EXPECTING
021332  104114                  20$:    ERROR   +114            ;UNDERFLOW.
021334  000740                          BR      4$
                                        
                                        ;IF AN FP TRAP OCCURS COME HERE.
021336  011602                  25$:    MOV     (SP),R2         ;GET ADDRESS OF TRAP.
021340  022702  021154                  CMP     #2$,R2          ;WAS THE TRAP DURING THE MULF INSTRUCTION?
021344  001402                          BEQ     26$             ;BRANCH IF YES.
021346  000137  036660                  JMP     @#FPSPUR        ;OTHERWISE GO REPORT A SPURIOUS
                                                                ;FP TRAP.
021352  022626                  26$:    CMP     (SP)+,(SP)+     ;RESET THE STACK.
021354  010237  001236                  MOV     R2,@#$TMP2      ;SAVE DATA FOR ERROR REPORT.
021360  170204                          STFPS   R4              ;GET FPS.
021362  170305                          STST    R5              ;GET FEC.
021364  012700  000200                  MOV     #200,R0         ;SET FD MODE.
021370  170100                          LDFPS   R0
021372  012700  021444                  MOV     #OVFNTT,R0      ;GET THE RESULT.
021376  174010                          STD     AC0,(R0)
021400  010537  001254                  MOV     R5,@#$TMP11
021404  020561  000024                  CMP     R5,24(R1)       ;WAS THE FEC ANTICIPATED?
021410  001004                          BNE     27$             ;BRANCH IF NOT ANTICIPATED.
                                        
021412  010102                          MOV     R1,R2           ;ERROR WAS ANTICIPATED SO
021414  062702  000030                  ADD     #30,R2          ;RETURN TO THE ERROR REPORT OF THE
                                                                ;CALLING ROUTINE.
021420  000112                          JMP     (R2)
                                        
021422  005761  000026          27$:    TST     26(R1)          ;THE ERROR WAS NOT ANTICIPATED SO
                                                                ;IT MUST BE REPORTED HERE. FIRST SEE IF EXPECTED
                                                                ;OVERFLOW OR UNDER FLOW.
021426  001003                          BNE     20$             ;BRANCH IF EXPECTING UNDERFLOW
                                        
```

```
3334                                                    ;REPORT TRAPPED ON OVERFLOW WITH FIV=0
3335 021430  104115                    28$:    ERROR   +115
3336 021432  000161  000036                    JMP     36(R1)
3337
3338 021436                            29$:                                    ;REPORT TRAPPED ON UNDER FLOW WITH FIU-0
3339 021436  104116                    30$:    ERROR   +116
3340 021440  000161  000036                    JMP     36(R1)
3341
3342 021444  000000  000000 -000000  .OVFNTT: .WORD   0,0,0,0
     021452  000000
3343
3344 021454                            IIIDONE:
     021454  104412                            RSETUP                          ;GO INITIALIZE THE FPS AND STACK; AND
                                                                               ;SEE IF THE USER HAS EXPRESSED
                                                                               ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                               ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                               ;THE USER TYPED CONTROL G?).
3345
3346
3347
3356
3357                                            ;TEST TITLE:UNDER/OVERFLOW, USING MULD WITH TRAP DISABLED
3358                                    ;;*****************************************************************
                                        ;*TEST 13       SEE COMMENT ABOVE FOR TEST TITLE
                                        ;*
                                        ;*THIS IS A TEST OF THE OVERFLOW AND UNDERFLOW CONDITIONS THAT CAN
                                        ;*ARRISE USING THE MULD INSTRUCTION WITH TRAPS DISABLED. A SUBROUTINE IS
                                        ;*USED TO SET UP THE OPERANDS, EXECUTE THE MULD INSTRUCTION AND
                                        ;*CHECK THE RESULTS.
                                        ;*
                                        ;;*****************************************************************
     021456  000004                     TST13:  SCOPE
3359
3360                                    ;UNDERFLOW, EXPONENT OF RESULT--129
3361 021460                             JJJ1:
     021460  104413                            LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
3362 021462  004737  022004                    JSR     PC,@#OVUNDNT
3363 021466  020200  000000            1$:     .WORD   20200,0                 ;AC
3364 021472  127272  000000                    .WORD   127272,0
3365 021476  020000  000000  000000    2$:     .WORD   20000,0,0,0             ;FSRC
     021504  000000
3366 021506  000000  000000  000000    3$:     .WORD   0,0,0,0                 ;RES
     021514  000000
3367 021516  000000  000000            4$:     .WORD   0,0                     ;ERROR RES.
3368 021522  127272  000000                    .WORD   127272,0
3369 021526  000200                    5$:     200                             ;FPS BEFORE EXECUTION.
3370 021530  000204                            204                             ;FPS AFTER EXECUTION.
3371 021532  000012                    6$:     12                              ;FEC
3372 021534  177777                            -1                              ;FLAG
3373 021536  104131                    7$:     ERROR   +131                    ;ST 331 TO 155 INTO 115 (BUT FIU)
3374 021540  000401                            BR      8$
3375 021542  104132                            ERROR   +132                    ;ST 115 (BUT FD)
3376 021544                            8$:
3377
3378                                    ;UNDERFLOW, EXPONENT OF RESULT - -193
3379 021544                             JJJ2:
     021544  104413                            LPERR                           ;SET UP THE LOOP ON ERROR ADDRESS.
```

```
3380 021546  004737  022004                    JSR     PC,@#OVUNDNT
3381 021552  010200  000000          1$:       .WORD   10200,0          ;AC
3382 021556  123456  000000                    .WORD   123456,0
3383 021562  010000  000000  000000  2$:       .WORD   10000,0,0,0      ;FSRC
     021570  000000
3384 021572  000000  000000  000000  3$:       .WORD   0,0,0,0          ;RES
     021600  000000
3385 021602  000000  000000  123456  4$:       .WORD   0,0,123456,0     ;ERROR RES
     021610  000000
3386 021612  005213                  5$:       5213                     ;FPS BEFORE EXECUTION.
3387 021614  005204                            5204                     ;FPS AFTER EXECUTION.
3388 021616  000012                  6$:       12                       ;FEC
3389 021620  177777                            -1                       ;FLAG
3390 021622  104133                  7$:       ERROR   +133             ;SETTING FIUV OR FIV BAD.
3391 021624  000401                            BR      8$
3392 021626  104132                            ERROR   +132             ;ST 115 (BUT FD)
3393 021630                         8$:
3394
3395                                ;OVERFLOW, EXPONENT OF RESULT = 128
3396 021630                         JJJ3:
     021630  104413                            LPERR                    ;SET UP THE LOOP ON ERROR ADDRESS.
3397 021632  004737  022004                    JSR     PC,@#OVUNDNT
3398 021636  060200  000000          1$:       .WORD   60200,0          ;AC
3399 021642  065432  000000                    .WORD   65432,0
3400 021646  060000  000000  000000  2$:       .WORD   60000,0,0,0      ;FSRC
     021654  000000
3401 021656  000000  000000  000000  3$:       .WORD   0,0,0,0          ;RES
     021664  000000
3402 021666  000000  000000  065432  4$:       .WORD   0,0,65432,0      ;ERROR RES.
     021674  000000
3403 021676  000200                  5$:       200                      ;FPS BEFORE EXECUTION.
3404 021700  000206                            206                      ;FPS AFTER EXECUTION.
3405 021702  000010                  6$:       10                       ;FEC
3406 021704  000000                            0                        ;FLAG
3407 021706  104134                  7$:       ERROR   +134             ;ST 333 TO 136 INTO 116 (BUT FIV)
3408 021710  000401                            BR      8$
3409 021712  104135                            ERROR   +135             ;ST 116 (BUT FD)
3410 021714                         8$:
3411
3412
3413                                ;OVERFLOW, EXPONENT OF RESULT = 130
3414 021714                         JJJ4:
     021714  104413                            LPERR                    ;SET UP THE LOOP ON ERROR ADDRESS.
3415 021716  004737  022004                    JSR     PC,@#OVUNDNT
3416 021722  060200  000000          1$:       .WORD   60200,0          ;AC
3417 021726  125252  000000                    .WORD   125252,0
3418 021732  060200  000000  000000  2$:       .WORD   60200,0,0,0      ;FSRC
     021740  000000
3419 021742  000000  000000  000000  3$:       .WORD   0,0,0,0          ;RES
     021750  000000
3420 021752  000000  000000  125252  4$:       .WORD   0,0,125252,0     ;ERROR RES.
     021760  000000
3421 021762  006211                  5$:       6211                     ;FPS BEFORE EXECUTION.
3422 021764  006206                            6206                     ;FPS AFTER EXECUTION.
3423 021766  000010                  6$:       10                       ;FEC
3424 021770  000000                            0                        ;FLAG
3425 021772  104136                  7$:       ERROR   +136             ;SETTING FIUV OR FIV BAD.
```

```
3426 021774  000401                        BR      8$
3427 021776  104135                        ERROR   +135            ;ST 116 (BUT FD)
3428 022000  000137  022414          8$:    JMP     @#JJJDONE       ;GO TO NEXT TEST.
3429
3430                                ;THIS SUBROUTINE, OVUNDNT, IS USED TO SET UP THE OPERANDS, EXECUTE
3431                                ;THE MULD INSTRUCTION AND CHECK THE RESULTS OF AN INSTRUCTION WITH
3432                                ;OPERANDS WHICH SHOULD RESULT IN EITHER OVERFLOW OR UNDERFLOW. A CALL
3433                                ;TO IT IS MADE THUS:
3434                                ;
3435                                ;       ACARG:   .WORD   X,X,X,X        ;AC OPERAND
3436                                ;       FSRCARG:.WORD    X,X,X,X        ;FSRC OPERAND
3437                                ;       RES:     .WORD   X,X,X,X        ;EXPECTED RESULT
3438                                ;       ERRES:   .WORD   X,X,X,X        ;ERROR RESULT
3439                                ;       FPSB:    .WORD   X              ;FPS BEFORE EXECUTION
3440                                ;       FPSA:    .WORD   X              ;FPS AFTER EXECUTION
3441                                ;       FEC:     .WORD   X              ;EXPECTED FEC
3442                                ;       FLAG:    .WORD   X              ;0/-1,OVER/UNDER FLOW FLAG
3443                                ;       ERR1:    ERROR   +X             ;TRAP ERROR.
3444                                ;       BR       CONT
3445                                ;       ERR2:    ERROR   +X             ;DATA, RESULT ERROR
3446                                ;       CONT:                           ;RETURN ADDRESS
3447                                ;
3448                                ;THE OPERANDS ARE SET UP (USING AC0 AS THE ACCUMULATOR). THEN
3449                                ;THE MULD INSTRUCTION IS EXECUTED. IF NO TRAP OCCURS THEN THE
3450                                ;RESULT IS CHECKED AGAINST RES. IF THE RESULT IS CORRECT THEN THE FPS IS
3451                                ;COMPARED WITH FPSA IF THIS TOO IS CORRECT OVUNDNT RETURNS CONTROL
3452                                ;TO THE CALLING ROUTINE AT CONT. IF THE FPS IS BAD OVUNDNT
3453                                ;REPORTS THIS FAILURE AND THEN RETURNS TO CONT. IF THE RESULT OF THE
3454                                ;MULD IS INCORRECT, THE INCORRECT RESULT IS COMPARED WITH THE
3455                                ;ANTICIPATED FAILING DATA PATTERN, ERRES. IF THE FAILURE IN
3456                                ;THE RESULT WAS ANTICIPATED CORRECTLY TO BE ERRES THEN OVUNDNT
3457                                ;WILL TRANSFER CONTROL TO THE ERROR CALL AT ERR2. OTHERWISE THE
3458                                ;RESULT WAS INCORRECT BUT WAS NOT ANTICIPATED AND OVUNDNT WILL
3459                                ;REPORT THE FAILURE AFTER WHICH CONTROL WILL BE PASSED TO CONT.
3460                                ;IF A TRAP OCCURS (IT SHOULD NOT) THEN OVUNDNT WILL READ THE FEC.
3461                                ;SHOULD THE FEC MATCH THE ANTICIPATED FEC OVUNDNT WILL
3462                                ;STORE ALL DATA AND TRANSFER CONTROL TO THE ERROR CALL AT ERR1. IF THE
3463                                ;FEC IS NOT THE SAME AS THE ANTICIPATED FEC OVUNDNT WILL REPORT
3464                                ;THE ERROR AND RETURN TO CONT. NOTE THAT OVUNDNT USES THE FLAG
3465                                ;TO TELL WHETHER OR NOT THESE PARTICULAR OPERANDS WILL RESULT IN
3466                                ;UNDERFLOW (FLAG=-1) OR OVERFLOW (FLAG=0).
3467
3468 022004  012601                  OVUNDNT:      MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
3469 022006  012700  000200                        MOV     #200,R0         ;SET FD MODE.
3470 022012  170100                              LDFPS   R0
3471
3472 022014  010100                              MOV     R1,R0           ;LOAD AC0, OPERAND.
3473 022016  172410                              LDD     (R0),AC0
3474
3475 022020  010102                              MOV     R1,R2           ;SAVE THE DATA PATTERNS IN CASE OF
3476 022022  010237  001240                      MOV     R2,@#$TMP3      ;ERROR.
3477 022026  062702  000010                      ADD     #10,R2
3478 022032  010237  001242                      MOV     R2,@#$TMP4
3479 022036  062702  000010                      ADD     #10,R2
3480 022042  010237  001244                      MOV     R2,@#$TMP5
3481 022046  016137  000042  001252              MOV     42(R1),@#$TMP10
3482 022054  012737  022404  001246              MOV     #OVDNTT,@#$TMP6
```

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3483
3484 022062  016100  000040                MOV     40(R1),R0       ;LOAD THE FPS.
3485 022066  170100                        LDFPS   R0
3486 022070  012737  022112  001236        MOV     #1$,@#$TMP2
3487 022076  012737  022276  000244        MOV     #25$,@#FPVECT   ;SET UP THE FP TRAP VECTOR IN CASE
3488                                                                ;OF ERROR.
3489 022104  010100                        MOV     R1,R0           ;COMPUTE THE ADDRESS OF FSRC.
3490 022106  062700  000010                ADD     #10,R0
3491
3492 022112  171010              1$:       MULD    (R0),AC0        ;TEST INSTRUCTION.
3493
3494 022114  170204              2$:       STFPS   R4              ;GET FPS.
3495 022116  170305                        STST    R5              ;GET FEC.
3496 022120  012700  000200                MOV     #200,R0         ;SET FD MODE.
3497 022124  170100                        LDFPS   R0
3498 022126  012700  022404                MOV     #OVDNTT,R0      ;GET THE RESULT.
3499 022132  174010                        STD     AC0,(R0)
3500 022134  010437  001250                MOV     R4,@#$TMP7
3501 022140  010537  001254                MOV     R5,@#$TMP11
3502
3503 022144  012700  022404                MOV     #OVDNTT,R0      ;CHECK THE RESULT.
3504 022150  010102                        MOV     R1,R2
3505 022152  062702  000020                ADD     #20,R2
3506 022156  012703  000004                MOV     #4,R3
3507 022162  022022              3$:       CMP     (R0)+,(R2)+
3508 022164  001015                        BNE     15$             ;BRANCH IF INCORRECT.
3509 022166  077303                        SOB     R3,3$
3510
3511 022170  026104  000042                CMP     42(R1),R4       ;WAS FPS CORRECT?
3512 022174  001002                        BNE     10$             ;BRANCH IF FPS IS INCORRECT.
3513
3514 022176  000161  000056        4$:     JMP     56(R1)          ;RETURN, TEST COMPLETED.
3515
3516                              ;REPORT INCORRECT FPS.
3517 022202  005761  000046      10$:      TST     46(R1)          ;WAS THE RESULT OVER OR UNDER FLOW?
3518 022206  001002                        BNE     12$             ;BRANCH IF UNDERFLOW.
3519
3520                                                              ;REPORT FPS BAD AFTER OVERFLOW.
3521 022210  104123              11$:      ERROR   +123
3522 022212  000771                        BR      4$
3523
3524 022214                      12$:                              ;REPORT FPS BAD AFTER UNDERFLOW.
3525 022214  104124              13$:      ERROR   +124
3526 022216  000767                        BR      4$
3527
3528                              ;RESULT INCORRECT.
3529 022220  012700  022404      15$:      MOV     #OVDNTT,R0      ;SEE IF FAILURE IS ANTICIPATED
3530 022224  010102                        MOV     R1,R2           ;FAILURE.
3531 022226  062702  000030                ADD     #30,R2
3532 022232  012703  000004                MOV     #4,R3
3533 022236  022022              16$:      CMP     (R0)+,(R2)+
3534 022240  001007                        BNE     17$             ;BRANCH IF NOT ANTICIPATED.
3535 022242  077303                        SOB     R3,16$
3536
3537 022244  010102                        MOV     R1,R2           ;ERROR WAS ANTICIPATED SO RETURN
3538 022246  062702  000054                ADD     #54,R2          ;TO THE ERROR REPORT IN THE CALLING
3539 022252  010237  001236                MOV     R2,@#$TMP2      ;ROUTINE.
```

```
3540 022256  000112                          JMP     (R2)
3541
3542 022260  005761  000046          17$:    TST     46(R1)          ;RESULT WAS NOT ANTICIPATED
3543                                                                 ;SO ERROR MUST BE REPORTED HERE.
3544                                                                 ;FIRST SEE IF ARGUMENTS SHOULD
3545                                                                 ;HAVE RESULTED IN OVERFLOW OR UNDER
3546                                                                 ;FLOW BY LOOKING AT THE FLAG.
3547 022264  001002                          BNE     19$             ;BRANCH IF UNDERFLOW EXPECTED.
3548
3549                                                                 ;REPORT RESULT INCORRECT, EXPECTING
3550 022266  104125                  18$:    ERROR   +125            ;OVERFLOW.
3551 022270  000742                          BR      4$
3552
3553 022272                          19$:                            ;REPORT RESULT INCORRECT, EXPECTING
3554 022272  104126                  20$:    ERROR   +126            ;UNDERFLOW.
3555 022274  000740                          BR      4$
3556
3557                                 ;IF AN FP TRAP OCCURS COME HERE.
3558 022276  011602                  25$:    MOV     (SP),R2         ;GET ADDRESS OF TRAP.
3559 022300  022702  022114                  CMP     #2$,R2          ;WAS THE TRAP DURING THE MULF INSTRUCTION?
3560 022304  001402                          BEQ     26$             ;BRANCH IF YES.
3561 022306  000137  036660                  JMP     @#FPSPUR        ;OTHERWISE GO REPORT A SPURIOUS
3562                                                                 ;FP TRAP.
3563 022312  022626                  26$:    CMP     (SP)+,(SP)+     ;RESET THE STACK.
3564 022314  010237  001236                  MOV     R2,@#$TMP2      ;SAVE DATA FOR ERROR REPORT.
3565 022320  170204                          STFPS   R4              ;GET FPS.
3566 022322  170305                          STST    R5              ;GET FEC.
3567 022324  012700  000200                  MOV     #200,R0         ;SET FD MODE.
3568 022330  170100                          LDFPS   R0
3569 022332  012700  022404                  MOV     #OVDNTT,R0      ;GET THE RESULT.
3570 022336  174010                          STD     AC0,(R0)
3571 022340  010537  001254                  MOV     R5,@#$TMP11
3572 022344  020561  000044                  CMP     R5,44(R1)       ;WAS THE FEC ANTICIPATED?
3573 022350  001004                          BNE     27$             ;BRANCH IF NOT ANTICIPATED.
3574
3575 022352  010102                          MOV     R1,R2           ;ERROR WAS ANTICIPATED SO
3576 022354  062702  000050                  ADD     #50,R2          ;RETURN TO THE ERROR REPORT OF THE
3577                                                                 ;CALLING ROUTINE.
3578 022360  000112                          JMP     (R2)
3579
3580 022362  005761  000026          27$:    TST     26(R1)          ;THE ERROR WAS NOT ANTICIPATED SO
3581                                                                 ;IT MUST BE REPORTED HERE. FIRST SEE IF EXPECTED
3582                                                                 ;OVERFLOW OR UNDER FLOW.
3583 022366  001003                          BNE     29$             ;BRANCH IF EXPECTING UNDERFLOW
3584
3585                                                                 ;REPORT TRAPPED ON OVERFLOW WITH FIV=0
3586 022370  104127                  28$:    ERROR   +127
3587 022372  000161  000056                  JMP     56(R1)
3588
3589 022376                          29$:                            ;REPORT TRAPPED ON UNDER FLOW WITH FIU=0
3590 022376  104130                  30$:    ERROR   +130
3591 022400  000161  000056                  JMP     56(R1)
3592
3593 022404  000000  000000  000000  OVDNTT: .WORD   0,0,0,0
     022412  000000
3594
3595 022414                          JJJDONE:
```

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        022414  104412                          RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                        ;SEE IF THE USER HAS EXPRESSED
                                                                        ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                        ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                        ;THE USER TYPED CONTROL G?).

   3596
   3597
   3598
   3610
   3611                                         ;TEST TITLE:UNDER/OVERFLOW, USING MULF WITH TRAPS ENABLED
   3612                                 ;;*****************************************************************
                                        ;*TEST 14       SEE COMMENT ABOVE FOR TEST TITLE
                                        ;*
                                        ;*THIS IS A TEST OF THE UNDERFLOW AND OVERFLOW
                                        ;*CONDITIONS THAT CAN OCCUR USING THE MULF INSTRUCTION.
                                        ;*A SUBROUTINE IS CALLED TO SET UP THE OPERANDS,
                                        ;* EXECUTE THE MULF INSTRUCTION AND CHECK
                                        ;*THE RESULTS. HERE THE PARTICULAR INTERRUPT,
                                        ;*EITHER OVERFLOW OR UNDERFLOW, IS ENABLED SO A TRAP SHOULD
                                        ;*OCCUR.
                                        ;*
                                        ;*****************************************************************
        022416  000004                  TST14:  SCOPE
   3613
   3614                                 ;UNDERFLOW, EXPONENT OF RESULT - -129
   3615 022420                          KKK1:
        022420  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
   3616 022422  004737  022644                  JSR     PC,@#OVUNFT
   3617 022426  020123  045676          1$:     .WORD   20123,45676     ;AC
   3618 022432  020200  000000          2$:     .WORD   20200,0         ;FSRC
   3619 022436  000123  045676          3$:     .WORD   123,45676       ;RES
   3620 022442  177777  177777          4$:     .WORD   -1,-1           ;ERROR RES.
   3621 022446  002000                  5$:     2000                    ;FPS BEFORE EXECUTION.
   3622 022450  102004                          102004                  ;FPS AFTER EXECUTION.
   3623 022452  000012                  6$:     12                      ;FEC
   3624 022454  177777                          -1                      ;FLAG
   3625 022456  104145                  7$:     ERROR   +145            ;ST 331 (BUT FIU) NO TRAP.
   3626 022460  000401                          BR      8$
   3627 022462  104144                          ERROR   +144
   3628 022464                          8$:
   3629
   3630                                 ;UNDERFLOW, EXPONENT OF THE RESULT - -193
   3631 022464                          KKK3:
        022464  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
   3632 022466  004737  022644                  JSR     PC,@#OVUNFT
   3633 022472  010127  127272          1$:     .WORD   10127,127272    ;AC
   3634 022476  010200  000000          2$:     .WORD   10200,0         ;FSRC
   3635 022502  060127  127272          3$:     .WORD   60127,127272    ;RES
   3636 022506  177777  177777          4$:     .WORD   -1,-1           ;ERROR RES.
   3637 022512  007017                  5$:     7017                    ;FPS BEFORE EXECUTION.
   3638 022514  107000                          107000                  ;FPS AFTER EXECUTION.
   3639 022516  000012                  6$:     12                      ;FEC
   3640 022520  177777                          -1
   3641 022522  104146                  7$:     ERROR   +146            ;ST 137 (BUT FIU) NO TRAP.
   3642 022524  000401                          BR      8$
   3643 022526  104144                          ERROR   +144
   3644 022530                          8$:
```

```
3645
3646                                    ;OVERFLOW, EXPONENT OF THE RESULT = 128
3647 022530                             KKK4:
     022530  104413                             LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
3648 022532  004737  022644                     JSR     PC,@#OVUNFT
3649 022536  060252  125252             1$:     .WORD   60252,125252    ;AC
3650 022542  060000  000000             2$:     .WORD   60000,0         ;FSRC
3651 022546  000052  125252             3$:     .WORD   000052,125252   ;RES
3652 022552  177777  177777             4$:     .WORD   -1,-1           ;ERROR RES.
3653 022556  001000                     5$:     1000                    ;FPS BEFORE EXECUTION.
3654 022560  101006                             101006                  ;FPS AFTER EXECUTION.
3655 022562  000010                     6$:     10                      ;FEC
3656 022564  000000                             0                       ;FLAG
3657 022566  104147                     7$:     ERROR   +147            ;ST 333 (BUT FIV) NO TRAP
3658 022570  000401                             BR      8$
3659 022572  104143                             ERROR   +143
3660 022574                             8$:
3661
3662                                    ;OVERFLOW, EXPONENT OF RESULT = 130
3663 022574                             KKK5:
     022574  104413                             LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
3664 022576  004737  022644                     JSR     PC,@#OVUNFT
3665 022602  060345  067654             1$:     .WORD   60345,67654     ;AC
3666 022606  060200  000000             2$:     .WORD   60200,0         ;FSRC
3667 022612  000345  067654             3$:     .WORD   345,67654       ;RES
3668 022616  177777  177777             4$:     .WORD   -1,-1           ;ERROR RES.
3669 022622  007015                     5$:     7015                    ;FPS BEFORE EXECUTION.
3670 022624  107002                             107002                  ;FPS AFTER EXECUTION.
3671 022626  000010                     6$:     10                      ;FEC
3672 022630  000000                             0                       ;FLAG
3673 022632  104150                     7$:     ERROR   +150            ;ST 133 (BUT FIV) NO TRAP
3674 022634  000401                             BR      8$
3675 022636  104143                             ERROR   +143
3676 022640  000167  000412             8$:     JMP     KKKDONE
3677
3678                                    ;THIS SUBROUTINE, OVUNFT, IS USED TO SET UP THE OPERANDS, EXECUTE
3679                                    ;THE MULF INSTRUCTION AND CHECK THE RESULTS OF AN INSTRUCTION WITH
3680                                    ;OPERANDS WHICH SHOULD RESULT IN EITHER OVERFLOW OR UNDERFLOW. A CALL
3681                                    ;TO IT IS MADE THUS:
3682                                    ;
3683                                    ;               ACARG:  .WORD   X,X             ;AC OPERAND
3684                                    ;               FSRCARG:.WORD   X,X             ;FSRC OPERAND
3685                                    ;               RES:    .WORD   X,X             ;EXPECTED RESULT
3686                                    ;               ERRES:  .WORD   X,X             ;ERROR RESULT
3687                                    ;               FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
3688                                    ;               FPSA:   .WORD   X               ;FPS AFTER EXECUTION
3689                                    ;               FEC:    .WORD   X               ;EXPECTED FEC
3690                                    ;               FLAG:   .WORD   X               ;0/-1,OVER/UNDER FLOW FLAG
3691                                    ;               ERR1:   ERROR   +X              ;TRAP ERROR.
3692                                    ;               BR      CONT
3693                                    ;               ERR2:   ERROR   +X              ;DATA, RESULT ERROR
3694                                    ;               CONT:                           ;RETURN ADDRESS
3695                                    ;
3696                                    ;THE OPERANDS ARE SET UP (USING AC0 AS THE ACCUMULATOR). THEN
3697                                    ;THE MULF INSTRUCTION IS EXECUTED. IF THE TRAP OCCURS THEN THE
3698                                    ;RESULT IS CHECKED AGAINST RES. IF THE RESULT IS CORRECT THEN THE FPS IS
3699                                    ;COMPARED WITH FPSA IF THIS TOO IS CORRECT OVUNFT RETURNS CONTROL
```

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                                        ;TO THE CALLING ROUTINE AT CONT. IF THE FPS IS BAD OVUNFT
                                        ;REPORTS THIS FAILURE AND THEN RETURNS TO CONT. THE FEC IS TREATED
                                        ;IN THE SAME WAY. IF THE RESULT OF THE
                                        ;MULF IS INCORRECT, THE INCORRECT RESULT IS COMPARED WITH THE
                                        ;ANTICIPATED FAILING DATA PATTERN, ERRES. IF THE FAILURE IN
                                        ;THE RESULT WAS ANTICIPATED CORRECTLY TO BE ERRES THEN OVUNFT
                                        ;WILL TRANSFER CONTROL TO THE ERROR CALL AT ERR2. OTHERWISE THE
                                        ;RESULT WAS INCORRECT BUT WAS NOT ANTICIPATED AND OVUNFT WILL
                                        ;REPORT THE FAILURE AFTER WHICH CONTROL WILL BE PASSED TO CONT.
                                        ;IF NO TRAP OCCURS CONTROL IS PASSED TO ERR1.
                                        ;NOTE THAT OVUNFNT USES THE FLAG
                                        ;TO TELL WHETHER OR NOT THESE PARTICULAR OPERANDS WILL RESULT IN
                                        ;UNDERFLOW (FLAG=-1) OR OVERFLOW (FLAG=0).

022644  012601                  OVUNFT: MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS.
022646  012700  000200                  MOV     #200,R0         ;SET FD MODE.
022652  170100                          LDFPS   R0

022654  010100                          MOV     R1,R0           ;LOAD AC0, OPERAND.
022656  172410                          LDD     (R0),AC0

022660  010102                          MOV     R1,R2           ;SAVE THE DATA PATTERNS IN CASE OF
022662  010237  001240                  MOV     R2,@#$TMP3      ;ERROR.
022666  062702  000004                  ADD     #4,R2
022672  010237  001242                  MOV     R2,@#$TMP4
022676  062702  000004                  ADD     #4,R2
022702  010237  001244                  MOV     R2,@#$TMP5
022706  016137  000022  001252          MOV     22(R1),@#$TMP10
022714  012737  023246  001246          MOV     #OVFTT,@#$TMP6

022722  016100  000020                  MOV     20(R1),R0       ;LOAD THE FPS.
022726  170100                          LDFPS   R0
022730  012737  022752  001236          MOV     #1$,@#$TMP2
022736  012737  022762  000244          MOV     #50$,@#FPVECT   ;SET UP THE FP TRAP VECTOR IN CASE
                                                                ;OF ERROR.
022744  010100                          MOV     R1,R0           ;COMPUTE THE ADDRESS OF FSRC.
022746  062700  000004                  ADD     #4,R0

022752  171010                  1$:     MULF    (R0),AC0        ;TEST INSTRUCTION. SHOULD CAUSE TRAP.
022754  170000                  2$:     CFCC

022756  000137  023206                  JMP     @#25$           ;FAILURE, NO TRAP.

022762  011602                  50$:    MOV     (SP),R2         ;TRAP TO HERE AND SEE IF THE PC OF THE
022764  020227  022754                  CMP     R2,#2$          ;TRAP WAS THAT OF THE MULF INSTRUCTION.
022770  001402                          BEQ     51$             ;BRANCH IF YES.
022772  000137  036660                  JMP     @#FPSPUR        ;OTHERWISE REPORT SPURIOUS FP ERROR.

022776  022626                  51$:    CMP     (SP)+,(SP)+     ;RESET THE STACK
023000  170204                          STFPS   R4              ;GET FPS.
023002  170305                          STST    R5              ;GET FEC.
023004  012700  000200                  MOV     #200,R0         ;SET FD MODE.
023010  170100                          LDFPS   R0
023012  012700  023246                  MOV     #OVFTT,R0       ;GET THE RESULT.
023016  174010                          STD     AC0,(R0)
023020  010437  001250                  MOV     R4,@#$TMP7
023024  010537  001254                  MOV     R5,@#$TMP11
```

```
                                                    ;CHECK THE RESULT.
023030  012700  023246          MOV     #OVFTT,R0
023034  010102                  MOV     R1,R2
023036  062702  000010          ADD     #10,R2
023042  012703  000002          MOV     #2,R3
023046  022022          3$:     CMP     (R0)+,(R2)+
023050  001027                  BNE     15$             ;BRANCH IF INCORRECT.
023052  077303                  SOB     R3,3$

023054  026104  000022          CMP     22(R1),R4       ;WAS FPS CORRECT?
023060  001014                  BNE     10$             ;BRANCH IF FPS IS INCORRECT.

023062  026105  000024          CMP     24(R1),R5       ;IS FEC CORRECT?
023066  001002                  BNE     5$              ;IF INCORRECT BRANCH.
023070  000161  000036  4$:     JMP     36(R1)          ;RETURN, TEST COMPLETED.

                        ;REPORT INCORRECT FEC.
023074  005761  000026  5$:     TST     26(R1)          ;WAS THE RESULT OVERFLOW OR UNDERFLOW?
023100  001002                  BNE     7$              ;BRANCH IF UNDERFLOW.

                                                        ;REPORT BAD FEC ON EXPECTED OVERFLOW.
023102  104137          6$:     ERROR   +137
023104  000771                  BR      4$

023106                  7$:                             ;REPORT BAD FEC ON EXPECTED UNDERFLOW.
023106  104140          8$:     ERROR   +140
023110  000767                  BR      4$

                        ;REPORT INCORRECT FPS.
023112  005761  000026  10$:    TST     26(R1)          ;WAS THE RESULT OVER OR UNDER FLOW?
023116  001002                  BNE     12$             ;BRANCH IF UNDERFLOW.

                                                        ;REPORT FPS BAD AFTER OVERFLOW.
023120  104141          11$:    ERROR   +141
023122  000762                  BR      4$

023124                  12$:                            ;REPORT FPS BAD AFTER UNDERFLOW.
023124  104142          13$:    ERROR   +142
023126  000760                  BR      4$

                        ;RESULT INCORRECT.
023130  012700  023246  15$:    MOV     #OVFTT,R0       ;SEE IF FAILURE IS ANTICIPATED
023134  010102                  MOV     R1,R2           ;FAILURE.
023136  062702  000014          ADD     #14,R2
023142  012703  000002          MOV     #2,R3
023146  022022          16$:    CMP     (R0)+,(R2)+
023150  001007                  BNE     17$             ;BRANCH IF NOT ANTICIPATED.
023152  077303                  SOB     R3,16$

023154  010102                  MOV     R1,R2           ;ERROR WAS ANTICIPATED SO RETURN
023156  062702  000034          ADD     #34,R2          ;TO THE ERROR REPORT IN THE CALLING
023162  010237  001236          MOV     R2,@#$TMP2      ;ROUTINE.
023166  000112                  JMP     (R2)

023170  005761  000026  17$:    TST     26(R1)          ;RESULT WAS NOT ANTICIPATED
                                                        ;SO ERROR MUST BE REPORTED HERE.
                                                        ;FIRST SEE IF ARGUMENTS SHOULD
```

```
                                                        ;HAVE RESULTED IN OVERFLOW OR UNDER
                                                        ;FLOW BY LOOKING AT THE FLAG.
023174  001002                    BNE     19$             ;BRANCH IF UNDERFLOW EXPECTED.

                                                        ;REPORT RESULT INCORRECT, EXPECTING
023176  104143            18$:    ERROR   +143            ;OVERFLOW.
023200  000733                    BR      4$

023202                    19$:                            ;REPORT RESULT INCORRECT, EXPECTING
023202  104144            20$:    ERROR   +144            ;UNDERFLOW.
023204  000731                    BR      4$

                          ;IF NO FP TRAP OCCURS COME HERE.
023206  170204            25$:    STFPS   R4              ;GET FPS.
023210  170305                    STST    R5              ;GET FEC.
023212  012700  000200            MOV     #200,R0         ;SET FD MODE.
023216  170100                    LDFPS   R0
023220  012700  023246            MOV     #OVFTT,R0       ;GET THE RESULT.
023224  174010                    STD     AC0,(R0)
023226  010437  001250            MOV     R4,@#$TMP7
023232  010537  001254            MOV     R5,@#$TMP11
023236  010102                    MOV     R1,R2           ;ERROR WAS ANTICIPATED SO
023240  062702  000030            ADD     #30,R2          ;RETURN TO THE ERROR REPORT OF THE
                                                        ;CALLING ROUTINE.
023244  000112                    JMP     (R2)

023246  000000  000000  000000  OVFTT:  .WORD   0,0,0,0
023254  000000

023256                    KKKDONE:
023256  104412                    RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                        ;SEE IF THE USER HAS EXPRESSED
                                                        ;THE DESIRE TO CHANGE THE SOFTWARE
                                                        ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                        ;THE USER TYPED CONTROL G?).


                          ;TEST TITLE:UNDER/OVERFLOW, USING MULD WITH TRAPS ENABLED
                          ;;*****************************************************************
                          ;*TEST 15       SEE COMMENT ABOVE FOR TEST TITLE
                          ;*
                          ;*THIS IS A TEST OF THE OVER FLOW AND UNDER FLOW CONDITIONS USING THE
                          ;*MULD INSTRUCTION WITH TRAPS ENABLED. A SUBROUTINE IS USED TO SET UP
                          ;*THE OPERANDS, EXECUTE THE MULD INSTRUCTION AND CHECK THE RESULTS.
                          ;*
                          ;;*****************************************************************
023260  000004            TST15:  SCOPE

                          ;UNDERFLOW, EXPONENT OF RESULT = -129
023262                    LLL1:
023262  104413                    LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
023264  004737  023606            JSR     PC,@#OVUNDT
023270  020052  125252    1$:     .WORD   20052,125252    ;AC
023274  125252  125252            .WORD   125252,125252
023300  020300  000000  000000  2$:     .WORD   20300,0,0,0     ;FSR
```

```
        023306  000000
3863    023310  000177  177777  177777  3$:     .WORD   177,-1,-1,-1      ;RES
        023316  177777
3864    023320  000177  177777          4$:     .WORD   177,-1            ;ERROR RES.
3865    023324  125252  125252                  .WORD   125252,125252
3866    023330  002200                  5$:     2200                      ;FPS BEFORE EXECUTION.
3867    023332  102204                          102204                    ;FPS AFTER EXECUTION.
3868    023334  000012                  6$:     12                        ;FEC
3869    023336  177777                          -1                        ;FLAG
3870    023340  104157                  7$:     ERROR   +157              ;ST 331 (BUT FIU) NO TRAP.
3871    023342  000401                          BR      8$
3872    023344  104160                          ERROR   +160              ;ST 155 (BUT FD)
3873    023346                          8$:
3874
3875                                    ;UNDERFLOW, EXPONENT OF THE RESULT = -193
3876    023346                          LLL2:
        023346  104413                          LPERR                     ;SET UP THE LOOP ON ERROR ADDRESS.
3877    023350  004737  023606                  JSR     PC,@#OVUNDT
3878    023354  010327  127272          1$:     .WORD   10327,127272      ;AC
3879    023360  036363  045454                  .WORD   36363,45454
3880    023364  010000  000000  000000  2$:     .WORD   10000,0,0,0       ;FSRC
        023372  000000
3881    023374  060127  127272          3$:     .WORD   60127,127272      ;RES
3882    023400  036363  045454                  .WORD   36363,45454
3883    023404  177777  177777  177777  4$:     .WORD   -1,-1,-1,-1       ;ERROR RES.
        023412  177777
3884    023414  007217                  5$:     7217                      ;FPS BEFORE EXECUTION.
3885    023416  107200                          107200                    ;FPS AFTER EXECUTION.
3886    023420  000012                  6$:     12                        ;FEC
3887    023422  177777                          -1                        ;FLAG
3888    023424  104161                  7$:     ERROR   +161              ;ST 137 (BUT FIU) NO TRAP.
3889    023426  000401                          BR      8$
3890    023430  104156                          ERROR   +156
3891    023432                          8$:
3892
3893                                    ;OVERFLOW, EXPONENT OF THE RESULT = 128
3894    023432                          LLL3:
        023432  104413                          LPERR                     ;SET UP THE LOOP ON ERROR ADDRESS.
3895    023434  004737  023606                  JSR     PC,@#OVUNDT
3896    023440  060252  125252          1$:     .WORD   60252,125252      ;AC
3897    023444  125252  125252                  .WORD   125252,125252     ;FSRC
3898    023450  160100  000000  000000  2$:     .WORD   160100,0,0,0      ;FSRC
        023456  000000
3899    023460  100177  177777  177777  3$:     .WORD   100177,-1,-1,-1   ;RES
        023466  177777
3900    023470  100177  177777          4$:     .WORD   100177,-1         ;ERROR RES.
3901    023474  125252  125252                  .WORD   125252,125252
3902    023500  001200                  5$:     1200                      ;FPS BEFORE EXECUTION.
3903    023502  101216                          101216                    ;FPS AFTER EXECUTION.
3904    023504  000010                  6$:     10                        ;FEC
3905    023506  000000                          0                         ;FLAG
3906    023510  104162                  7$:     ERROR   +162              ;ST 333 (BUT FIV) NO TRAP.
3907    023512  000401                          BR      8$
3908    023514  104163                          ERROR   +163              ;ST 700 (BUT FD).
3909    023516                          8$:
3910
3911                                    ;OVERFLOW, EXPONENT OF THE RESULT = 130
```

```
 3912 023516                          LLL4:
      023516  104413                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 3913 023520  004737  023606                 JSR     PC,@#OVUNDT
 3914 023524  060345  067654          1$:    .WORD   60345,67654     ;AC
 3915 023530  056765  045676                 .WORD   56765,45676
 3916 023534  060200  000000  000000  2$:    .WORD   60200,0,0,0     ;FSRC
      023542  000000
 3917 023544  000345  067654          3$:    .WORD   345,67654       ;RES
 3918 023550  056765  045676                 .WORD   56765,45676
 3919 023554  177777  177777  177777  4$:    .WORD   -1,-1,-1,-1     ;ERROR RES.
      023562  177777
 3920 023564  007215                  5$:    7215                    ;FPS BEFORE EXECUTION.
 3921 023566  107202                         107202                  ;FPS AFTER EXECUTION.
 3922 023570  000010                  6$:    10                      ;FEC
 3923 023572  000000                         0                       ;FLAG
 3924 023574  104164                  7$:    ERROR   +164            ;ST 133 (BUT FIV) NO TRAP
 3925 023576  000401                         BR      8$
 3926 023600  104155                         ERROR   +155
 3927 023602  000137  024220          8$:    JMP     @#LLLDONE
 3928
 3929                                 ;THIS SUBROUTINE, OVUNDT, IS USED TO SET UP THE OPERANDS, EXECUTE
 3930                                 ;THE MULD INSTRUCTION AND CHECK THE RESULTS OF AN INSTRUCTION WITH
 3931                                 ;OPERANDS WHICH SHOULD RESULT IN FITHER OVERFLOW OR UNDERFLOW. A CAL-
 3932                                 ;TO IT IS MADE THUS:
 3933                                 ;
 3934                                 ;               ACARG:  .WORD   X,X,X,X         ;AC OPERAND
```

```
                                        FSRCARG:.WORD   X,X,X,X          ;FSRC OPERAND
                                        RES:    .WORD   X,X,X,X          ;EXPECTED RESULT
                                        ERRES:  .WORD   X,X,X,X          ;ERROR RESULT
                                        FPSB:   .WORD   X                ;FPS BEFORE EXECUTION
                                        FPSA:   .WORD   X                ;FPS AFTER EXECUTION
                                        FEC:    .WORD   X                ;EXPECTED FEC
                                        FLAG:   .WORD   X                ;0/-1,OVER/UNDER FLOW FLAG
                                        ERR1:   ERROR   +X               ;TRAP ERROR.
                                        BR      CONT
                                        ERR2:   ERROR   +X               ;DATA, RESULT ERROR
                                        CONT:                            ;RETURN ADDRESS

                                ;THE OPERANDS ARE SET UP (USING AC0 AS THE ACCUMULATOR). THEN
                                ;THE MULD INSTRUCTION IS EXECUTED. IF THE TRAP OCCURS THEN THE
                                ;RESULT IS CHECKED AGAINST RES. IF THE RESULT IS CORRECT THEN THE FPS IS
                                ;COMPARED WITH FPSA IF THIS TOO IS CORRECT OVUNDT RETURNS CONTROL
                                ;TO THE CALLING ROUTINE AT CONT. IF THE FPS IS BAD OVUNDT
                                ;REPORTS THIS FAILURE AND THEN RETURNS TO CONT. THE FEC IS TREATED
                                ;IN THE SAME WAY. IF THE RESULT OF THE
                                ;MULF IS INCORRECT, THE INCORRECT RESULT IS COMPARED WITH THE
                                ;ANTICIPATED FAILING DATA PATTERN, ERRES. IF THE FAILURE IN
                                ;THE RESULT WAS ANTICIPATED CORRECTLY TO BE ERRES THEN OVUNDT
                                ;WILL TRANSFER CONTROL TO THE ERROR CALL AT ERR2. OTHERWISE THE
                                ;RESULT WAS INCORRECT BUT WAS NOT ANTICIPATED AND OVUNDT WILL
                                ;REPORT THE FAILURE AFTER WHICH CONTROL WILL BE PASSED TO CONT.
                                ;IF NO TRAP OCCURS CONTROL IS PASSED TO ERR1.
                                ;NOTE THAT OVUNDNT USES THE FLAG
                                ;TO TELL WHETHER OR NOT THESE PARTICULAR OPERANDS WILL RESULT IN
                                ;UNDERFLOW (FLAG=-1) OR OVERFLOW (FLAG=0).

023606  012601                  OVUNDT: MOV     (SP)+,R1         ;GET A POINTER TO THE ARGUMENTS.
023610  012700  000200                  MOV     #200,R0          ;SET FD MODE.
023614  170100                          LDFPS   R0

023616  010100                          MOV     R1,R0            ;LOAD AC0, OPERAND.
023620  172410                          LDD     (R0),AC0

023622  010102                          MOV     R1,R2            ;SAVE THE DATA PATTERNS IN CASE OF
023624  010237  001240                  MOV     R2,@#$TMP3       ;ERROR.
023630  062702  000010                  ADD     #10,R2
023634  010237  001242                  MOV     R2,@#$TMP4
023640  062702  000010                  ADD     #10,R2
023644  010237  001244                  MOV     R2,@#$TMP5
023650  016137  000042  001252          MOV     42(R1),@#$TMP10
023656  012737  024210  001246          MOV     #OVDTT,@#$TMP6

023664  016100  000040                  MOV     40(R1),R0        ;LOAD THE FPS.
023670  170100                          LDFPS   R0
023672  012737  023714  001236          MOV     #1$,@#$TMP2
023700  012737  023724  000244          MOV     #50$,@#FPVECT    ;SET UP THE FP TRAP VECTOR IN CASE
                                                                 ;OF ERROR.
023706  010100                          MOV     R1,R0            ;COMPUTE THE ADDRESS OF FSRC.
023710  062700  000010                  ADD     #10,R0

023714  171010                  1$:     MULD    (R0),AC0         ;TEST INSTRUCTION. SHOULD CAUSE TRAP.
023716  170000                  2$:     CFCC
```

```
3993 023720  000137  024150                    JMP     @#25$           ;FAILURE, NO TRAP.
3994
3995 023724  011602                  50$:      MOV     (SP),R2         ;TRAP TO HERE AND SEE IF THE PC OF THE
3996 023726  020227  023716                    CMP     R2,#2$          ;TRAP WAS THAT OF THE MULF INSTRUCTION.
3997 023732  001402                            BEQ     51$             ;BRANCH IF YES.
3998 023734  000137  036660                    JMP     @#FPSPUR        ;OTHERWISE REPORT SPURIOUS FP ERROR.
3999
4000 023740  022626                  5?$:      CMP     (SP)+,(SP)+     ;RESET THE STACK
4001 023742  170204                            STFPS   R4              ;GET FPS.
4002 023744  170305                            STST    R5              ;GET FEC.
4003 023746  012700  000?.00                    MOV     #200,R0         ;SET FD MODE.
4004 023752  170100                            LDFPS   R0
4005 023754  012700  024210                    MOV     #OVDTT,R0       ;GET THE RESULT.
4006 023760  174010                            STD     AC0,(R0)
4007 023762  010437  001250                    MOV     R4,@#$TMP7
4008 023766  010537  001?54                    MOV     R5,@#$TMP11
4009
4010 023772  012700  024210                    MOV     #OVDTT,R0       ;CHECK THE RESULT.
4011 023776  010102                            MOV     R1,R2
4012 024000  062702  000020                    ADD     #20,R2
4013 024004  012703  000004                    MOV     #4,R3
4014 024010  022022                  ?$:       CMP     (R0)+,(R2)+
4015 024012  001027                            BNE     15$             ;BRANCH IF INCORRECT.
4016 024014  077303                            SOB     R3,3$
4017
4018 024016  026104  000042                    CMP     42(R1),R4       ;WAS FPS CORRECT?
4019 024022  001014                            BNE     10$             ;BRANCH IF FPS IS INCORRECT.
4020
4021 024024  026105  000044                    CMP     44(R1),R5       ;IS FEC CORRECT?
4022 024030  001002                            BNE     5$              ;IF INCORRECT BRANCH.
4023 024032  000161  000056            4$:     JMP     56(R1)          ;RETURN, TEST COMPLETED.
4024
4025                                  ;REPORT INCORRECT FEC.
4026 024036  005761  000046            5$:     TST     46(R1)          ;WAS THE RESULT OVERFLOW OR UNDERFLOW?
4027 024042  001002                            BNE     7$              ;BRANCH IF UNDERFLOW.
4028
4029                                                                  ;REPORT BAD FEC ON EXPECTED OVERFLOW.
4030 024044  104151                  6$:       ERROR   +151
4031 024046  000771                            BR      4$
4032
4033 024050                           7$:                             ;REPORT BAD FEC ON EXPECTED UNDERFLOW.
4034 024050  104152                  8$:       ERROR   +152
4035 024052  000767                            BR      4$
4036
4037                                  ;REPORT INCORRECT FPS.
4038 024054  005761  000046            10$:    TST     46(R1)          ;WAS THE RESULT OVER OR UNDER FLOW?
4039 024060  001002                            BNE     12$             ;BRANCH IF UNDERFLOW.
4040
4041                                                                  ;REPORT FPS BAD AFTER OVERFLOW.
4042 024062  104153                  11$:      ERROR   +153
4043 024064  000762                            BR      4$
4044
4045 024066                           12$:                            ;REPORT FPS BAD AFTER UNDERFLOW.
4046 024066  104154                  13$:      ERROR   +154
4047 024070  000760                            BR      4$
4048
4049                                  ;RESULT INCORRECT.
```

```
4050 024072  012700  024210          15$:   MOV    #OVDTT,R0        ;SEE IF FAILURE IS ANTICIPATED
4051 024076  010102                         MOV    R1,R2            ;FAILURE.
4052 024100  062702  000030                 ADD    #30,R2
4053 024104  012703  000004                 MOV    #4,R3
4054 024110  022022                 16$:    CMP    (R0)+,(R2)+
4055 024112  001007                         BNE    17$              ;BRANCH IF NOT ANTICIPATED.
4056 024114  077303                         SOB    R3,16$
4057
4058 024116  010102                         MOV    R1,R2            ;ERROR WAS ANTICIPATED SO RETURN
4059 024120  062702  000054                 ADD    #54,R2           ;TO THE ERROR REPORT IN THE CALLING
4060 024124  010237  001236                 MOV    R2,@#$TMP2       ;ROUTINE.
4061 024130  000112                         JMP    (R2)
4062
4063 024132  005761  000046          17$:   TST    46(R1)           ;RESULT WAS NOT ANTICIPATED
4064                                                                 ;SO ERROR MUST BE REPORTED HERE.
4065                                                                 ;FIRST SEE IF ARGUMENTS SHOULD
4066                                                                 ;HAVE RESULTED IN OVERFLOW OR UNDER
4067                                                                 ;FLOW BY LOOKING AT THE FLAG.
4068 024136  001002                         BNE    19$              ;BRANCH IF UNDERFLOW EXPECTED.
4069
4070                                                                 ;REPORT RESULT INCORRECT, EXPECTING
4071 024140  104155                 18$:    ERROR  +155             ;OVERFLOW.
4072 024142  000733                         BR     4$
4073
4074 024144                         19$:                            ;REPORT RESULT INCORRECT, EXPECTING
4075 024144  104156                 20$:    ERROR  +156             ;UNDERFLOW.
4076 024146  000731                         BR     4$
4077
4078                                 ;IF NO FP TRAP OCCURS COME HERE.
4079 024150  170204                 25$:    STFPS  R4               ;GET FPS.
4080 024152  170305                         STST   R5               ;GET FEC.
4081 024154  012700  000200                 MOV    #200,R0          ;SET FD MODE.
4082 024160  170100                         LDFPS  R0
4083 024162  012700  024210                 MOV    #OVDTT,R0        ;GET THE RESULT.
4084 024166  174010                         STD    AC0,(R0)
4085 024170  010437  001250                 MOV    R4,@#$TMP7
4086 024174  010537  001254                 MOV    R5,@#$TMP11
4087 024200  010102                         MOV    R1,R2            ;ERROR WAS ANTICIPATED SO
4088 024202  062702  000050                 ADD    #50,R2           ;RETURN TO THE ERROR REPORT OF THE
4089                                                                 ;CALLING ROUTINE.
4090 024206  000112                         JMP    (R2)
4091
4092 024210  000000  000000  000000  OVDTT: .WORD  0,0,0,0
     024216  000000
4093
4094 024220                         LLLDONE:
     024220  104412                         RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                     ;SEE IF THE USER HAS EXPRESSED
                                                                     ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                     ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                     ;THE USER TYPED CONTROL G?).
4095
4096
4097
4098
4106
4107                                 ;;*****************************************************************
```

```
                                ;*TEST 16       MODF TEST
                                ;*
                                ;*THIS IS A TEST OF THE MODF INSTRUCTION, WHICH MAKES USE OF
                                ;*A SUBROUTINE TO SET UP THE OPERANDS, EXECUTE THE MODF INSTRUCTION
                                ;*AND CHECK THE RESULTS.
                                ;*
                                ;**********************************************************************
     024222  000004             TST16:  SCOPE
 4108
 4109                           ;MODF WITH (FSRC=AC=0)
 4110 024224
     024224  104413                     LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4111 024226  004737  025310            JSR     PC,@#MODFSUB
 4112 024232  000000  000000    1$:     .WORD   0,0             ;AC
 4113 024236  000000  000000    2$:     .WORD   0,0             ;FSRC
 4114 024242  000000  000000    3$:     .WORD   0,0             ;FRACTIONAL RES.
 4115 024246  000000  000000    4$:     .WORD   0,0             ;INTEGER RES.
 4116 024252  177777  177777    5$:     .WORD   -1,-1           ;ERROR FRACTIONAL RES.
 4117 024256  177777  177777    6$:     .WORD   -1,-1           ;ERROR INGETER RES.
 4118 024262  000013            7$:     13                      ;FPS BEFORE EXECUTION.
 4119 024264  000004                    4                       ;FPS AFTER EXECUTION.
 4120 024266  104056            8$:     ERROR   +56             ;STORE SINGLE ZERO BAD.
 4121 024270  000401                    BR      9$
 4122 024272  104057                    ERROR   +57             ;AC V 1 <- ZERO FAILED.
 4123 024274                    9$:
 4124
 4125                           ;MODF TEST, WITH (FSRC-0)
 4126 024274
     024274  104413             GGG2:
                                        LPERR                   ,SET UP THE LOOP ON ERROR ADDRESS.
 4127 024276  004737  025310            JSR     PC,@#MODFSUB
 4128 024302  123456  076543    1$:     .WORD   123456,76543    ;AC
 4129 024306  000000  000000    2$:     .WORD   0,0             ;FSRC
 4130 024312  000000  000000    3$:     .WORD   0,0             ;FRACTIONAL RES.
 4131 024316  000000  000000    4$:     .WORD   0,0             ;INTEGER RESULT.
 4132 024322  123456  076543    5$:     .WORD   123456,76543    ;ERROR FRACTIONAL RES.
 4133 024326  177777  177777    6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
 4134 024332  000000            7$:     0                       ;FPS BEFORE EXECUTION.
 4135 024334  000004                    4                       ;FPS AFTER EXECUTION.
 4136 024336  104056            8$:     ERROR   +56             ;STORE ZERO FAILURE.
 4137 024340  000401                    BR      9$
 4138 024342  104057                    ERROR   +57
 4139 024344                    9$:
 4140
 4141                           ;MODF TEST WITH (AC=0)
 4142 024344
     024344  104413             GGG3:
                                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4143 024346  004737  025310            JSR     PC,@#MODFSUB
 4144 024352  000000  000000    1$:     .WORD   0,0             ;AC
 4145 024356  076543  021234    2$:     .WORD   76543,21234     ;FSRC
 4146 024362  000000  000000    3$:     .WORD   0,0             ;FRACTIONAL RES.
 4147 024366  000000  000000    4$:     .WORD   0,0             ;INTEGER RES.
 4148 024372  000000  000000    5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
 4149 024376  177777  177777    6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
 4150 024402  000003            7$:     3                       ;FPS BEFORE EXECUTION.
 4151 024404  000004                    4                       ;FPS AFTER EXECUTION.
 4152 024406  104053            8$·     ERROR   +53             ;RES.BAD
 4153 024410  000401                    BR      9$
```

```
                                        ERROR   +57
                                9$:

                                ;MODF TEST WITH EXPONENT OF THE RESULT = 25
                                GGG4:
                                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
024414  104413
024416  004737  025310                  JSR     PC,@#MODFSUB
024422  046252  125252            1$:   .WORD   46252,125252    ;AC
024426  040300  000000            2$:   .WORD   40300,0         ;FSRC
024432  000000  000000            3$:   .WORD   0,0             ;FRACTIONAL RES.
024436  046377  177777            4$:   .WORD   46377,-1        ;INTEGER RES.
024442  046252  125252            5$:   .WORD   46252,125252    ;ERROR FRACTIONAL RES.
024446  040300  000000            6$:   .WORD   40300,0         ;ERROR INTEGER RES.
024452  000013                    7$:   13                      ;FPS BEFORE EXECUTION.
024454  000004                          4                       ;FPS AFTER EXFCUTION.
024456  104053                    8$:   ERROR   +53             ;ST 134
024460  000401                          BR      9$
024462  104060                          ERROR   +60
024464                          9$:

                                ;MODF TEST WITH EXPONENT OF THE RESULT = 127
                                GGG5:
024464
        024464  104413                  LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
024466  004737  025310                  JSR     PC,@#MODFSUB
024472  077652  125252            1$:   .WORD   77652,125252    ;AC
024476  040300  000000            2$:   .WORD   40300,0         ;FSRC
024502  000000  000000            3$:   .WORD   0,0             ;FRACTIONAL RES.
024506  077777  177777            4$:   .WORD   77777,-1        ;INTEGER RES.
024512  077652  125252            5$:   .WORD   77652,125252    ;ERROR FRACTIONAL RES.
024516  040300  000000            6$:   .WORD   40300,0         ;ERROR INTEGER RES.
024522  000000                    7$:   0                       ;FPS BEFORE EXECUTION.
024524  000004                          4                       ;FPS AFTER EXECUTION.
024526  104053                    8$:   ERROR   +53
024530  000401                          BR      9$
024532  104060                          ERROR   +60
024534                          9$:

                                ;MODF TEST WITH EXPONENT OF RESULT = 25
                                GGG6:
024534
        024534  104413                  LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
024536  004737  025310                  JSR     PC,@#MODFSUB
024542  046200  000001            1$:   .WORD   46200,1         ;AC
024546  040340  000000            2$:   .WORD   40340,0         ;FSRC
024552  000000  000000            3$:   .WORD   0,0             ;FRACTIONAL RES.
024556  046340  000001            4$:   .WORD   46340,1         ;INTEGER RES.
024562  040000  000000            5$:   .WORD   40000,0         ;ERROR FRACTIONAL RES.
024566  177777  177777            6$:   .WORD   -1,-1           ;ERROR INTEGER RES.
024572  000013                    7$:   13                      ;FPS BEFORE EXECUTION.
024574  000004                          4                       ;FPS AFTER EXECUTION.
024576  104061                    8$:   ERROR   +61             ;BAD CONSTANT (NOT 24),
                                                                ;OR ST 525 TO 050 INTO 150.
024600  000401                          BR      9$
024602  104054                          ERROR   +54
024604                          9$:

                                ;MODF   TEST WITH EXPONENT OF THE RESULT   24
024604                          GGG7:
```

```
                024604  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4208            024606  004737  025310                  JSR     PC,@#MODFSUB
4209            024612  046000  000001          1$:     .WORD   46000,1         ;AC
4210            024616  040340  000000          2$:     .WORD   40340,0         ;FSRC
4211            024622  040100  000000          3$:     .WORD   40100,0         ;FRACTIONAL RES.
4212            024626  046140  000001          4$:     .WORD   46140,1         ;INTEGER RESULT.
4213            024632  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
4214            024636  177777  177777          6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
4215            024642  000000                  7$:     0                       ;FPS BEFORE EXECUTION.
4216            024644  000000                          0                       ;FPS AFTER EXECUTION.
4217            024646  104062                  8$:     ERROR   +62             ;BAD CONSTANT USED (NOT 24)
4218                                                                            ;OR ST 525 TO 150 INTO 050
4219            024650  000401                          BR      9$
4220            024652  104054                          ERROR   +54
4221            024654                          9$:
4222
4223                                            ;MODF TEST WITH EXPONENT OF THE RESULT - 10
4224            024654                          GGG8:
                024654  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4225            024656  004737  025310                  JSR     PC,@#MODFSUB
4226            024662  042577  177777          1$:     .WORD   42577,-1        ;AC
4227            024666  040200  000000          2$:     .WORD   40200,0         ;FSRC
4228            024672  040177  176000          3$:     .WORD   40177,176000    ;FRACTIONAL RES.
4229            024676  042577  140000          4$:     .WORD   42577,140000    ;INTEGER RES.
4230            024702  177777  177777          5$:     .WORD   -1,-1           ;ERROR FRACTIONAL RES.
4231            024706  177777  177777          6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
4232            024712  000000                  7$:     0                       ;FPS BEFORE EXECUTION.
4233            024714  000000                          0                       ;FPS AFTER EXECUTION.
4234            024716  104053                  8$:     ERROR   +53
4235            024720  000401                          BR      9$
4236            024722  104054                          ERROR   +54
4237            024724                          9$:
4238
4239                                            ;MODF TEST WITH THE EXPONENT OF THE RESULT = 10
4240            024724                          GGG9:
                024724  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4241            024726  004737  025310                  JSR     PC,@#MODFSUB
4242            024732  042577  140001          1$:     .WORD   42577,140001    ;AC
4243            024736  040200  000000          2$:     .WORD   40200,0         ;FSRC
4244            024742  034600  000000          3$:     .WORD   34600,0         ;FRACTIONAL RES.
4245            024746  042577  140000          4$:     .WORD   42577,140000    ;INTEGER RES.
4246            024752  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
4247            024756  177777  177777          6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
4248            024762  000000                  7$:     0                       ;FPS BEFORE EXECUTION.
4249            024764  000000                          0                       ;FPS AFTER EXECUTION.
4250            024766  104063                  8$:     ERROR   +63             ;ST 532 TO 122 INTO NORMALIZE.
4251            024770  000401                          BR      9$
4252            024772  104054                          ERROR   +54
4253            024774                          9$:
4254
4255                                            ;MODF TEST WITH EXPONENT OF THE RESULT = 9
4256            024774                          GGG10:
                024774  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4257            024776  004737  025310                  JSR     PC,@#MODFSUB
4258            025002  042377  100000          1$:     .WORD   42377,100000    ;AC
4259            025006  040200  000000          2$:     .WORD   40200,0         ;FSRC
4260            025012  000000  000000          3$:     .WORD   0,0             ;FRACTIONAL RES.
```

```
 4261 025016  042377  100000          4$:     .WORD   42377,100000    ;INTEGER RES.
 4262 025022  177777  177777          5$:     .WORD   -1,-1           ;ERROR FRACTIONAL RES.
 4263 025026  177777  177777          6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
 4264 025032  000013                  7$:     13                      ;FPS BEFORE EXECUTION.
 4265 025034  000004                          4                       ;FPS AFTER EXECUTION.
 4266 025036  104053                  8$:     ERROR   +53
 4267 025040  000401                          BR      9$
 4268 025042  104054                          ERROR   +54
 4269 025044                          9$:
 4270
 4271                                 ;MODF TEST WITH EXPONENT OF THE RESULT = 0
 4272 025044                          GGG11:
      025044  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4273 025046  004737  025310                  JSR     PC,@#MODFSUB
 4274 025052  040177  177777          1$:     .WORD   40177,-1        ;AC
 4275 025056  040200  000000          2$:     .WORD   40200,0         ;FSRC
 4276 025062  040177  177777          3$:     .WORD   40177,-1        ;FRACTIONAL RES.
 4277 025066  000000  000000          4$:     .WORD   0,0             ;INTEGER RES.
 4278 025072  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
 4279 025076  040177  177777          6$:     .WORD   40177,-1        ;ERROR INTEGER RES.
 4280 025102  000017                  7$:     17                      ;FPS BEFORE EXECUTION.
 4281 025104  000000                          0                       ;FPS AFTER EXECUTION.
 4282 025106  104064                  8$:     ERROR   +64             ;ST 041 TO 046 INTO 246.
 4283 025110  000401                          BR      9$
 4284 025112  104064                          ERROR   +64
 4285 025114                          9$:
 4286
 4287                                 ;MODF TEST WITH EXPONENT OF THE RESULT = -15
 4288 025114                          GGG12:
      025114  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4289 025116  004737  025310                  JSR     PC,@#MODFSUB
 4290 025122  034377  177777          1$:     .WORD   34377,-1        ;AC
 4291 025126  040200  000000          2$:     .WORD   40200,0         ;FSRC
 4292 025132  034377  177777          3$:     .WORD   34377,-1        ;FRACTIONAL RES.
 4293 025136  000000  000000          4$:     .WORD   0,0             ;INTEGER RES.
 4294 025142  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
 4295 025146  034377  177777          6$:     .WORD   34377,-1        ;ERROR INTEGER RES.
 4296 025152  000000                  7$:     0                       ;FPS BEFORE EXECUTION.
 4297 025154  000000                          0                       ;FPS AFTER EXECUTION.
 4298 025156  104064                  8$:     ERROR   +64
 4299 025160  000401                          BR      9$
 4300 025162  104064                          ERROR   +64
 4301 025164                          9$:
 4302
 4303                                 ;MODF TEST WITH EXPONENT OF RESULT - -64, IN ROUND MODE
 4304 025164                          GGG13:
      025164  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4305 025166  004737  025310                  JSR     PC,@#MODFSUB
 4306 025172  020000  000001          1$:     .WORD   20000,1         ;AC
 4307 025176  040300  000000          2$:     .WORD   40300,0         ;FSRC
 4308 025202  020100  000002          3$:     .WORD   20100,2         ;FRACTIONAL RES.
 4309 025206  000000  000000          4$:     .WORD   0,0             ;INTEGER RES.
 4310 025212  020100  000001          5$:     .WORD   20100,1         ;ERROR FRACTIONAL RES.
 4311 025216  000000  000000          6$:     .WORD   0,0             ;ERROR INTEGER RES.
 4312 025222  000000                  7$:     0                       ;FPS BEFORE EXECUTION.
 4313 025224  000000                          0                       ;FPS AFTER EXECUTION.
 4314 025226  104065                  8$:     ERROR   +65             ;ROUND TRUNK, ST 126 INTO ROUND.
```

```
 4315 025230  000401                          BR      9$
 4316 025232  104054                          ERROR   +54
 4317 025234                          9$:
 4318
 4319                                 ;MODF TEST WITH EXPONENT OF RESULT = 11
 4320 025234                          GGG14:
      025234  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 4321 025236  004737  025310                  JSR     PC,@#MODFSUB
 4322 025242  142777  170000          1$:     .WORD   142777,170000   ;AC
 4323 025246  040200  000000          2$:     .WORD   40200,0         ;FSRC
 4324 025252  140000  000000          3$:     .WORD   140000,0        ;FRACTIONAL RES.
 4325 025256  142777  160000          4$:     .WORD   142777,160000   ;INTEGER RES.
 4326 025262  040000  000000          5$:     .WORD   40000,0         ;ERROR FRACTIONAL RES.
 4327 025266  042777  160000          6$:     .WORD   42777,160000    ;ERROR INTEGER RES.
 4328 025272  000007                  7$:     7                       ;FPS BEFORE EXECUTION.
 4329 025274  000010                          10                      ;FPS AFTER EXECUTION.
 4330 025276  104066                  8$:     ERROR   +66             ;SIGN OF FRACTION.
 4331 025300  000401                          BR      9$
 4332 025302  104067                          ERROR   +67             ;SIGN OF INTEGER.
 4333 025304  000167  000366          9$:     JMP     GGGDONE         ;GO TO NEXT TEST.
 4334
 4335
 4336                                 ;THIS SUBROUTINE, MODFSUB, IS CALLED TO SETUP THE
 4337                                 ;OPERANDS, EXECUTE THE MODF INSTRUCTION AND CHECK THE RESULTS.
 4338                                 ;IT IS CALLED THUS:
 4339                                 ;
 4340                                 ;       ACARG:  .WORD   X,X             ;AC OPERAND
 4341                                 ;       FSRCARG:.WORD   X,X             ;FSRC OPERAND
 4342                                 ;       FRES:   .WORD   X,X             ;FRACTIONAL RESULT
 4343                                 ;       INTRES: .WORD   X,X             ;INTEGER RESULT
 4344                                 ;       ERFRES: .WORD   X,X             ;ERROR FRACTION RESULT
 4345                                 ;       ERINTRES:.WORD  X,X             ;ERROR INTEGER RESULT
 4346                                 ;       FPSB:   .WORD   X               ;FPS BEFORE EXECUTION
 4347                                 ;       FPSA:   .WORD   X               ;FPS AFTER EXECUTION
 4348                                 ;       ERR1:   ERROR   +X              ;FRACTION ERROR
 4349                                 ;               BR      CONT
 4350                                 ;       ERR2:   ERROR   +X              ;INTEGER ERROR
 4351                                 ;       CONT:                           ;RETURN ADDRESS
 4352                                 ;
 4353                                 ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC ARGUMENT). THE MODF
 4354                                 ;INSTRUCTION IS EXECUTED. THEN THE RESULTS ARE RETRIEVED.
 4355                                 ;THE FRACTION PART OF THE RESULT IS COMPARED WITH FRES. IF THIS IS CORRECT
 4356                                 ;THEN THE INTEGER PART IS COMPARED WITH INTRES. IF BOTH OF THESE ARE CORRECT
 4357                                 ;THEN THE FPS IS COMPARED WITH FPSA. AFTER EXECUTION IF NO ERRORS OCCURRED
 4358                                 ;THEN MODFSUB WILL RETURN TO CONT. IF THE FPS WAS INCORRECT
 4359                                 ;IT IS REPORTED HERE. IF THE FRACTION IS INCORRECT IT IS COMPARED WITH
 4360                                 ;THE ANTICIPATED BAD FRACTION, ERFRES. IF THIS DOESN'T MATCH
 4361                                 ;THE TRUE RESULT THEN THE ERROR IS REPORTED HERE. IF THE ANTICIPATED
 4362                                 ;FAILURE MATCHES THE TRUE RESULT THEN  MODFSUB PASSES CONTROL TO THE
 4363                                 ;ERROR CALL AT ERR1. LIKEWISE IF THE INTEGER PART OF THE RESULT IS
 4364                                 ;NOT CORRECT THEN IT IS COMPARED WITH THE ANTICIPATED INTEGER
 4365                                 ;FAILURE. IF THIS DOEN'T MATCH THEN THE ERROR IS REPORTED HERE.
 4366                                 ;IF A MATCH IS MADE HOWEVER, MODFSUB WILL RETURN CONTROL TO THE ERROR
 4367                                 ;CALL AT ERR2.
 4368
 4369 025310  012601                  MODFSUB:        MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS
 4370 025312  012700  000200                  MOV     #200,R0         ;SET FD MODE.
```

```
4371 025316  170100                        LDFPS   R0
4372 025320  010100                        MOV     R1,R0           ;SET UP AC0
4373 025322  172410                        LDD     (R0),AC0
4374 025324  012700  025666                MOV     #MODP1,R0       ;PUT A BACKROUND PATTERN INTO AC1.
4375 025330  172510                        LDD     (R0),AC1
4376 025332  016100  000030                MOV     30(R1),R0       ;SET UP THE FPS.
4377 025336  170100                        LDFPS   R0
4378 025340  012737  025354  001236        MOV     #1$,@#$TMP2
4379 025346  010100                        MOV     R1,R0           ;COMPUTE THE ADDRESS OF THE FSRC.
4380 025350  062700  000004                ADD     #4,R0
4381
4382 025354  171410              1$:       MODF    (R0),AC0        ;EXECUTE THE TEST INSTRUCTION.
4383
4384 025356  170204                        STFPS   R4              ;GET THE FPS.
4385 025360  012700  000200                MOV     #200,R0         ;SET FD MODE.
4386 025364  170100                        LDFPS   R0
4387 025366  012700  025646                MOV     #MODFT0,R0      ;GET THE FRACTIONAL RESULT.
4388 025372  174010                        STD     AC0,(R0)
4389 025374  012700  025656                MOV     #MODFT1,R0      ;GET THE INTEGER RESULT.
4390 025400  174110                        STD     AC1,(R0)
4391
4392 025402  010102                        MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
4393 025404  010237  001240                MOV     R2,@#$TMP3
4394 025410  062702  000004                ADD     #4,R2
4395 025414  010237  001242                MOV     R2,@#$TMP4
4396 025420  062702  000004                ADD     #4,R2
4397 025424  010237  001244                MOV     R2,@#$TMP5
4398 025430  062702  000004                ADD     #4,R2
4399 025434  010237  001246                MOV     R2,@#$TMP6
4400 025440  012737  025646  001250        MOV     #MODFT0,@#$TMP7
4401 025446  012737  025656  001252        MOV     #MODFT1,@#$TMP10
4402 025454  010437  001254                MOV     R4,@#$TMP11
4403 025460  016137  000032  001256        MOV     32(R1),@#$TMP12
4404
4405 025466  012702  025646                MOV     #MODFT0,R2      ;CHECK THE FRACTIONAL RESULT.
4406 025472  026112  000010                CMP     10(R1),(R2)
4407 025476  001022                        BNE     10$             ;BRANCH IF INCORRECT.
4408 025500  026162  000012  000002        CMP     12(R1),2(R2)
4409 025506  001016                        BNE     10$
4410
4411 025510  012702  025656                MOV     #MODFT1,R2      ;CHECK THE INTEGER RESULT.
4412 025514  026112  000014                CMP     14(R1),(R2)
4413 025520  001026                        BNE     15$             ;BRANCH IF INCORRECT.
4414 025522  026162  000016  000002        CMP     16(R1),2(R2)
4415 025530  001022                        BNE     15$
4416
4417 025532  026104  000032                CMP     32(R1),R4       ;CHECK THE FPS.
4418 025536  001034                        BNE     20$             ;BRANCH IF INCORRECT.
4419
4420 025540  000161  000042        9$:     JMP     42(R1)          ;RETURN.
4421
4422                              ;FRACTIONAL ERROR.
4423 025544  026112  000020        10$:    CMP     20(R1),(R2)     ;WAS THE ERROR ANTICIPATED?
4424 025550  001010                        BNE     11$             ;BRANCH IF NOT ANTICIPATED.
4425 025552  026162  000022  000002        CMP     22(R1),2(R2)
4426 025560  001004                        BNE     11$
4427 025562  010102                        MOV     R1,R2           ;THE ERROR WAS ANTICIPATED SO
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4428 025564  062702  000034                    ADD     #34,R2          ;RETURN TO THE ERROR REPORT AT THE
4429                                                                     ;CALLING ROUTINE.
4430 025570  000112                            JMP     (R2)
4431
4432 025572                            11$:                             ;THE ERROR WAS NOT ANTICIPATED SO
4433 025572  104053                    12$:    ERROR   +53              ;REPORT THE INCORRECT FRACTION HERE.
4434 025574  000761                            BR      9$
4435
4436                                   ;INTEGER ERROR.
4437 025576  026112  000024            15$:    CMP     24(R1),(R2)      ;WAS THIS ERROR ANTICIPATED?
4438 025602  001010                            BNE     16$              ;BRANCH IF NOT.
4439 025604  026162  000026  000002            CMP     26(R1),2(R2)
4440 025612  001004                            BNE     16$
4441 025614  010102                            MOV     R1,R2            ;THE ERROR WAS ANTICIAPTED SO RETURN
4442 025616  062702  000040                    ADD     #40,R2           ;TO THE ERROR REPORT IN THE CALLING
4443                                                                     ;ROUTINE.
4444 025622  000112                            JMP     (R2)
4445
4446 025624                            16$:                             ;THE ERROR WAS NOT ANTICIPATED SO REPORT
4447 025624  10405                     17$:    ERROR   +54              ;THE INTEGER FAILURE HERE.
4448 025626  000744                            BR      9$
4449
4450                                   ;FPS INCORRECT.
4451 025630  010437  001254            20$:    MOV     R4,@#$TMP11      ;REPORT INCORRECT FPS.
4452 025634  016137  000032  001256            MOV     32(R1),@#$TMP12
4453 025642  104055                    21$:    ERROR   +55
4454 025644  000735                            BR      9$
4455
4456 025646  000000  000000  000000  MODFT0: .WORD   0,0,0,0
     025654  000000
4457
4458 025656  000000  000000  000000  MODFT1: .WORD   0,0,0,0
     025664  000000
4459
4460 025666  177777  177777  177777  MODP1:  .WORD   -1,-1,-1,-1
     025674  177777
4461
4462 025676                            GGGDONE:
     025676  104412                            RSTTUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                         ;SEE IF THE USER HAS EXPRESSED
                                                                         ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                         ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                         ;THE USER TYPED CONTROL G?).
4463
4464
4465
4473
4474                                   ;;*****************************************************************
                                       ;*TEST 17       MODD TEST
                                       ;*
                                       ;*THIS IS A TEST OF THE MODD INSTRUCTION. IT MAKES USE OF A SUBROUTINE
                                       ;*TO SET UP THE ARGUMENTS, EXECUTE THE INSTRUCTION AND CHECK THE
                                       ;*RESULTS.
                                       ;*
                                       ;;*****************************************************************
     025700  000004                    TST17:  SCOPE
4475
```

```
4476                                    ;MODD WITH (FSRC=AC-0)
4477 025702                             HHH1:
     025702  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4478 025704  004737  027406                    JSR     PC,@#MODDSUB
4479 025710  000000  000000  000000  1$:      .WORD   0,0,0,0         ;AC
     025716  000000
4480 025720  000000  000000  000000  2$:      .WORD   0,0,0,0         ;FSRC
     025726  000000
4481 025730  000000  000000  000000  3$:      .WORD   0,0,0,0         ;FRACTIONAL RES.
     025736  000000
4482 025740  000000  000000  000000  4$:      .WORD   0,0,0,0         ;INTEGER RES.
     025746  000000
4483 025750  000000  000000  000000  5$:      .WORD   0,0,0,0         ;ERROR FRACTIONAL RES.
     025756  000000
4484 025760  000000  000000  177777  6$:      .WORD   0,0,-1,-1       ;ERROR INTEGER RES.
     025766  177777
4485 025770  000200                    7$      200                     ;FPS BEFORE EXECUTION.
4486 025772  000204                            204                     ;FPS AFTER EXECUTION.
4487 025774  104070                    8$:     ERROR   +70
4488 025776  000401                            BR      9$
4489 026000  104074                            ERROR   +74             ;ST 231 TO 142 INTO 143
4490 026002                             9$:
4491
4492                                    ;MODD TEST WITH FSRC=0
4493 026002                             HHH2:
     026002  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4494 026004  004737  027406                    JSR     PC,@#MODDSUB
4495 026010  012345  067012            1$:     .WORD   012345,67012    ;AC
4496 026014  034567  012345                    .WORD   34567,012345
4497 026020  000000  000000  000000  2$:      .WORD   0,0,0,0         ;FSRC
     026026  000000
4498 026030  000000  000000  000000  3$:      .WORD   0,0,0,0         ;FRACTIONAL RES.
     026036  000000
4499 026040  000000  000000  000000  4$:      .WORD   0,0,0,0         ;INTEGER RES.
     026046  000000
4500 026050  012345  067012            5$:     .WORD   012345,67012    ;ERROR FRACTIONAL RES.
4501 026054  034567  012345                    .WORD   34567,012345
4502 026060  177777  177777  177777  6$:      .WORD   -1,-1,-1,-1     ;ERROR INTEGER RES.
     026066  177777
4503 026070  000213                    7$:     213                     ;FPS BEFORE EXECUTION.
4504 026072  000204                            204                     ;FPS AFTER EXECUTION.
4505 026074  104075                    8$:     ERROR   +75             ;STORE DOUBLE ZERO
4506 026076  000401                            BR      9$
4507 026100  104076                            ERROR   +76             ;AC V 1 <= ZERO ST 143
4508 026102                             9$:
4509
4510                                    ;MODD TEST WITH (AC=0)
4511 026102                             HHH3:
     026102  104413                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4512 026104  004737  027406                    JSR     PC,@#MODDSUB
4513 026110  000000  000000  000000  1$:      .WORD   0,0,0,0         ;AC
     026116  000000
4514 026120  072727  127272            2$:     .WORD   72727,127272    ;FSRC
4515 026124  072727  127272                    .WORD   72727,127272
4516 026130  000000  000000  000000  3$:      .WORD   0,0,0,0         ;FRACTIONAL RES.
     026136  000000
4517 026140  000000  000000  000000  4$:      .WORD   0,0,0,0         ;INTEGER RES.
```

```
                026146  000000
4518            026150  177777  177777  177777  5$:     .WORD   -1,-1,-1,-1       ;ERROR FRACTIONAL RES.
                026156  177777
4519            026160  177777  177777  177777  6$:     .WORD   -1,-1,-1,-1       ;ERROR INTEGER RES.
                026166  177777
4520            026170  000213                   7$:     213                       ;FPS BEFORE EXECUTION.
4521            026172  000204                           204                       ;FPS AFTER EXECUTION.
4522            026174  104070                   8$:     ERROR   +70
4523            026176  000401                           BR      9$
4524            026200  104071                           ERROR   +71
4525            026202                           9$:
4526
4527                                             ;MODD TEST WITH EXPONENT OF THE RESULT = 57
4528            026202                           HHH4:
                026202  104413                           LPERR                     ;SET UP THE LOOP ON ERROR ADDRESS.
4529            026204  004737  027406                   JSR     PC,@#MODDSUB
4530            026210  056252  125252           1$:     .WORD   56252,125252      ;AC
4531            026214  125252  125250                   .WORD   125252,125250
4532            026220  040300  000000  000000 2$:      .WORD   40300,0,0,0       ;FSRC
                026226  000000
4533            026230  000000  000000  000000 3$:      .WORD   0,0,0,0           ;FRACTIONAL RES.
                026236  000000
4534            026240  056377  177777  177777 4$:      .WORD   56377,-1,-1,-4    ;INTEGER RES.
                026246  177774
4535            026250  000000  000000           5$:     .WORD   0,0               ;ERROR FRACTIONAL RES.
4536            026254  125252  125252                   .WORD   125252,125252
4537            026260  056377  177777  177777 6$:      .WORD   56377,-1,-1,-1    ;ERROR INTEGER RES.
                026266  177777
4538            026270  000213                   7$:     213                       ;FPS BEFORE EXECUTION.
4539            026272  000204                           204                       ;FPS AFTER EXECUTION.
4540            026274  104077                   8$:     ERROR   +77               ;ST 526 TO 134 INTO 135
4541            026276  000401                           BR      9$
4542            026300  104077                           ERROR   +77
4543            026302                           9$:
4544
4545                                             ;MODD TEST WITH EXPONENT OF THE RESULT = 79
4546            026302                           HHH5:
                026302  104413                           LPERR                     ;SET UP THE LOOP ON ERROR ADDRESS.
4547            026304  004737  027406                   JSR     PC,@#MODDSUB
4548            026310  140240  000000  000000 1$:      .WORD   140240,0,0,0      ;AC
                026316  000000
4549            026320  063714  146314           2$:     .WORD   63714,146314      ;FSRC
4550            026324  133572  167737                   .WORD   133572,167737
4551            026330  000000  000000  000000 3$:      .WORD   0,0,0,0           ;FRACTIONAL RES.
                026336  000000
4552            026340  163777  177777           4$:     .WORD   163777,-1         ;INTEGER RES.
4553            026344  162531  125726                   .WORD   162531,125726
4554            026350  177777  177777  177777 5$:      .WORD   -1,-1,-1,-1       ;ERROR FRACTIONAL RES.
                026356  177777
4555            026360  063777  177777           6$:     .WORD   63777,-1          ;ERROR INTEGER RES.
4556            026364  162531  125726                   .WORD   162531,125726
4557            026370  000210                   7$:     210                       ;FPS BEFORE EXECUTION.
4558            026372  000204                           204                       ;FPS AFTER EXECUTION.
4559            026374  104070                   8$:     ERROR   +70
4560            026376  000401                           BR      9$
4561            026400  104100                           ERROR   +100              ;ST 526 BAD SIGN
4562            026402                           9$:
```

```
                                        ;MODD TEST WITH EXPONENT OF THE RESULT - 57
026402                                  HHH6:
026402  104413                                  LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
026404  004737  027406                          JSR     PC,@#MODDSUB
026410  056200  000000  000000  1$:     .WORD   56200,0,0,1     ;AC
026416  000001
026420  040340  000000  000000  2$:     .WORD   40340,0,0,0     ;FSRC
026426  000000
026430  000000  000000  000000  3$:     .WORD   0,0,0,0         ;FRACTIONAL RES.
026436  000000
026440  056340  000000  000000  4$:     .WORD   56340,0,0,1     ;INTEGER RES.
026446  000001
026450  040000  000000  000000  5$:     .WORD   40000,0,0,0     ;ERROR FRACTIONAL RES.
026456    0000
026460  056340  000000  000000  6$:     .WORD   56340,0,0,1     ;ERROR INTEGER RES.
026466  000001
026470  000213                  7$:     213                     ;FPS BEFORE EXECUTION.
026472  000204                          204                     ;FPS AFTER EXECUTION.
026474  104101                  8$:     ERROR   +101            ;CONSTANT BAD (NOT 56)
                                                                ;OR ST 525 TO 050 INTO 150
026476  000401                          BR      9$
026500  104101                          ERROR   +101
026502                          9$:
                                        ;MODD TEST WITH EXPONENT OF THE RESULT = 56
026502                                  HHH7:
026502  104413                                  LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
026504  004737  027406                          JSR     PC,@#MODDSUB
026510  056000  000000  000000  1$:     .WORD   56000,0,0,1     ;AC
026516  000001
026520  040340  000000  000000  2$:     .WORD   40340,0,0,0     ;FSRC
026526  000000
026530  040100  000000  000000  3$:     .WORD   40100,0,0,0     ;FRACTIONAL RES.
026536  000000
026540  056140  000000  000000  4$:     .WORD   56140,0,0,1     ;INTEGER RES.
026546  000001
026550  000000  000000  000000  5$:     .WORD   0,0,0,0         ;ERROR FRACTIONAL RES.
026556  000000
026560  056140  000000  000000  6$:     .WORD   56140,0,0,1     ;ERROR INTEGER RES.
026566  000001
026570  000213                  7$:     213                     ;FPS BEFORE EXECUTION.
```

```
4592 026572  000200                          200                    ;FPS AFTER EXECUTION.
4593 026574  104102                 8$:      ERROR   +102           ;BAD CONSTANT (NOT 56) OR
4594                                                                ;ST 525 TO 150 INTO 050
4595 026576  000401                          BR      9$
4596 026600  104102                          ERROR   +102
4597 026602                         9$:
4598
4599                                ;MODD TEST WITH EXPONENT OF THE RESULT = 36
4600 026602                         HHH8:
     026602  104413                          LPERR                  ;SET UP THE LOOP ON ERROR ADDRESS.
4601 026604  004737  027406                  JSR     PC,@#MODDSUB
4602 026610  051177  177777  177777  1$:      .WORD   51177,-1,-1,-1 ;AC
     026616  177777
4603 026620  040200  000000  000000  2$:      .WORD   40200,0,0,0    ;FSRC
     026626  000000
4604 026630  040177  177760  000000  3$:      .WORD   40177,-20,0,0  ;FRACTIONAL RES.
     026636  000000
4605 026640  051177  177777  177760  4$:      .WORD   51177,-1,-20,0 ;INTEGER RES.
     026646  000000
4606 026650  177777  177777  177777  5$:      .WORD   -1,-1,-1,-1    ;ERROR FRACTIONAL RES.
     026656  177777
4607 026660  177777  177777  177777  6$:      .WORD   -1,-1,-1,-1    ;ERROR INTEGER RES.
     026666  177777
4608 026670  000217                 7$:      217                    ;FPS BEFORE EXECUTION.
4609 026672  000200                          200                    ;FPS AFTER EXECUTION.
4610 026674  104070                 8$:      ERROR   +70
4611 026676  000401                          BR      9$
4612 026700  104071                          ERROR   +71
4613 026702                         9$:
4614
4615                                ;MODD TEST WITH EXPONENT OF THE RESULT - 30
4616 026702                         HHH9:
     026702  104413                          LPERR                  ;SET UP THE LOOP ON ERROR ADDRESS.
4617 026704  004737  027406                  JSR     PC,@#MODDSUB
4618 026710  040200  000000  000000  1$:      .WORD   40200,0,0,0    ;AC
     026716  000000
4619 026720  047577  177777             2$:      .WORD   47577,-1       ;FSRC
4620 026724  176000  000001                      .WORD   176000,1
4621 026730  031600  000000  000000  3$:      .WORD   31600,0,0,0    ;FRACTIONAL RES.
     026736  000000
4622 026740  047577  177777             4$:      .WORD   47577,-1       ;INTEGER RES.
4623 026744  176000  000000                      .WORD   176000,0
4624 026750  000000  000000  000000  5$:      .WORD   0,0,0,0        ;ERROR FRACTIONAL RES.
     026756  000000
4625 026760  047577  177777  177777  6$:      .WORD   47577,-1,-1,-1 ;ERROR INTEGER RES.
     026766  177777
4626 026770  000200                 7$:      200                    ;FPS BEFORE EXECUTION.
4627 026772  000200                          200                    ;FPS AFTER EXECUTION.
4628 026774  104103                 8$:      ERROR   +103           ;(NORMALIZE) ST 532 TO 122
4629                                                                ;INTO NORM.
4630 026776  000401                          BR      9$
4631 027000  104104                          ERROR   +104           ;AC V 1 <= X14
4632                                                                ;OR ST 733 TO 156 INTO 157.
4633 027002                         9$:
4634
4635                                ;MODD TEST WITH EXPONENT OF THE RESULT = 31
4636 027002                         HHH10:
```

```
        027002  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4637    027004  004737  027406                  JSR     PC,@#MODDSUB
4638    027010  047777  177777          1$:     .WORD   47777,-1        ;AC
4639    027014  177000  000000                  .WORD   177000,0
4640    027020  040200  000000  000000  2$:     .WORD   40200,0,0,0     ;FSRC
        027026  000000
4641    027030  000000  000000  000000  3$:     .WORD   0,0,0,0         ;FRACTIONAL RES.
        027036  000000
4642    027040  047777  177777          4$:     .WORD   47777,-1        ;INTEGER RES.
4643    027044  177000  000000                  .WORD   177000,0
4644    027050  000000  000000  177000  5$:     .WORD   0,0,177000,0    ;ERROR FRACTIONAL RES.
        027056  000000
4645    027060  177777  177777  177777  6$:     .WORD   -1,-1,-1,-1     ;ERROR INTEGER RES.
        027066  177777
4646    027070  000213                  7$:     213                     ;FPS BEFORE EXECUTION.
4647    027072  000204                          204                     ;FPS AFTER EXECUTION.
4648    027074  104105                  8$:     ERROR   +105            ;(BUT FD) STORE X10
4649    027076  000401                          BR      9$
4650    027100  104071                          ERROR   +71
4651    027102                          9$:
4652
4653                                    ;MODD TEST WITH EXPONENT OF THE RESULT = 0
4654    027102                          HHH11:
        027102  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4655    027104  004737  027406                  JSR     PC,@#MODDSUB
4656    027110  040200  000000  000000  1$:     .WORD   40200,0,0,0     ;AC
        027116  000000
4657    027120  040177  072727          2$:     .WORD   40177,72727     ;FSRC
4658    027124  127272  072727                  .WORD   127272,72727
4659    027130  040177  072727          3$:     .WORD   40177,72727     ;FRACTIONAL RES.
4660    027134  127272  072727                  .WORD   127272,72727
4661    027140  000000  000000  000000  4$:     .WORD   0,0,0,0         ;INTEGER RES.
        027146  000000
4662    027150  177777  177777  177777  5$:     .WORD   -1,-1,-1,-1     ;ERROR FRACTIONAL RES.
        027156  177777
4663    027160  000000  000000  177777  6$:     .WORD   0,0,-1,-1       ;ERROR INTEGER RES.
        027166  177777
4664    027170  000200                  7$:     200                     ;FPS BEFORE EXECUTION.
4665    027172  000200                          200                     ;FPS AFTER EXECUTION.
4666    027174  104070                  8$:     ERROR   +70
4667    027176  000401                          BR      9$
4668    027200  104106                          ERROR   +106            ;ST 246 TO 126 INTO 127 (BUT FD)
4669    027202                          9$:
4670
4671                                    ;MODD TEST WITH EXPONENT OF THE RESULT = -115
4672    027202                          HHH12:
        027202  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4673    027204  004737  027406                  JSR     PC,@#MODDSUB
4674    027210  003377  177777          1$:     .WORD   3377,-1         ;AC
4675    027214  177777  052525                  .WORD   -1,52525
4676    027220  040200  000000  000000  2$:     .WORD   40200,0,0,0     ;FSRC
        027226  000000
4677    027230  003377  177777          3$:     .WORD   3377,-1         ;FRACTIONAL RES.
4678    027234  177777  052525                  .WORD   -1,52525
4679    027240  000000  000000  000000  4$:     .WORD   0,0,0,0         ;INTEGER RES.
        027246  000000
4680    027250  177777  177777  177777  5$:     .WORD   -1,-1,-1,-1     ;ERROR FRACTIONAL RES.
```

```
                027256  177777
4681            027260  000000  000000  177777  6$:     .WORD   0,0,-1,-1          ;ERROR INTEGER RES.
                027266  177777
4682            027270  000200                  7$:     200                       ;FPS BEFORE EXECUTION.
4683            027272  000200                          200                       ;FPS AFTER EXECUTION.
4684            027274  104070                  8$:     ERROR   +70
4685            027276  000401                          BR      9$
4686            027300  104107                          ERROR   +107              ;ST 446 TO 126 INTO 127 (BUT FD)
4687            027302                          9$:
4688
4689                                            ;MODD TEST WITH EXPONENT OF THE RESULT = -63, IN ROUND MODE.
4690            027302                          HHH13:
                027302  104413                          ERR                       ;SET UP THE LOOP ON ERROR ADDRESS.
4691            027304  004737  027406                  JSR     PC,@#MODDSUB
4692            027310  040300  000000  000000  1$:     .WORD   40300,0,0,0       ;AC
                027316  000000
4693            027320  020200  000000  000000  2$:     .WORD   20200,0,0,1       ;FSRC
                027326  000001
4694            027330  020300  000000  000000  3$:     .WORD   20300,0,0,2       ;FRACTIONAL RES.
                027336  000002
4695            027340  000000  000000  000000  4$:     .WORD   0,0,0,0           ;INTEGER RES.
                027346  000000
4696            027350  000000  000000  177777  5$:     .WORD   0,0,-1,-1         ;ERROR FRACTIONAL RES.
                027356  177777
4697            027360  177777  177777  177777  6$:     .WORD   -1,-1,-1,-1       ;ERROR INTEGER RES.
                027366  177777
4698            027370  000200                  7$:     200                       ;FPS BEFORE EXECUTION.
4699            027372  000200                          200                       ;FPS AFTER EXECUTION.
4700            027374  104110                  8$:     ERROR   +110              ;ST 127 INTO RND/TR
4701            027376  000401                          BR      9$
4702            027400  104071                          ERROR   +71
4703            027402  000137  030004          9$:     JMP     @#HHHDONE         ;GO TO THE NEXT TEST.
4704
4705                                            ;THIS SUBROUTINE, MODDSUB, IS CALLED TO SETUP THE
4706                                            ;OPERANDS, EXECUTE THE MODD INSTRUCTION AND CHECK THE RESULTS.
4707                                            ;IT IS CALLED THUS:
4708                                            ;
4709                                            ;               ACARG:   .WORD   X,X,X,X          ;AC OPERAND
4710                                            ;               FSRCARG: .WORD   X,X,X,X          ;FSRC OPERAND
4711                                            ;               FRES:    .WORD   X,X,X,X          ;FRACTIONAL RESULT
4712                                            ;               INTRES:  .WORD   X,X,X,X          ;INTEGER RESULT
4713                                            ;               ERFRES:  .WORD   X,X,X,X          ;ERROR FRACTION RESULT
4714                                            ;               ERINTRES:.WORD   X,X,X,X          ;ERROR INTEGER RESULT
4715                                            ;               FPSB:    .WORD   X                ;FPS BEFORE EXECUTION
4716                                            ;               FPSA:    .WORD   X                ;FPS AFTER EXECUTION
4717                                            ;               ERR1:    ERROR   +X               ;FRACTION ERROR
4718                                            ;                        BR      CONT
4719                                            ;               ERR2:    ERROR   +X               ;INTEGER ERROR
4720                                            ;               CONT:                             ;RETURN ADDRESS
4721                                            ;
4722                                            ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC ARGUMENT). THE MODD
4723                                            ;INSTRUCTION IS EXECUTED. THEN THE RESULTS ARE RETRIEVED.
4724                                            ;THE FRACTION PART OF THE RESULT IS COMPARED WITH FRES. IF THIS IS CORRECT
4725                                            ;THEN THE INTEGER PART IS COMPARED WITH INTRES. IF BOTH OF THESE ARE CORRECT
4726                                            ;THEN THE FPS IS COMPARED WITH FPSA. AFTER EXECUTION IF NO ERRORS OCCURRED
4727                                            ;THEN MODDSUB WILL RETURN TO CONT. IF THE FPS WAS INCORRECT
4728                                            ;IT IS REPORTED HERE. IF THE FRACTION IS INCORRECT IT IS COMPARED WITH
```

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                                        ;THE ANTICIPATED BAD FRACTION, ERFRES. IF THIS DOESN'T MATCH
                                        ;THE TRUE RESULT THEN THE ERROR IS REPORTED HERE. IF THE ANTICIPATED
                                        ;FAILURE MATCHES THE TRUE RESULT THEN  MODDSUB PASSES CONTROL TO THE
                                        ;ERROR CALL AT ERR1. LIKEWISE IF THE INTEGER PART OF THE RESULT IS
                                        ;NOT CORRECT THEN IT IS COMPARED WITH THE ANTICIPATED INTEGER
                                        ;FAILURE. IF THIS DOEN'T MATCH THEN THE ERROR IS REPORTED HERE.
                                        ;IF A MATCH IS MADE HOWEVER, MODDSUB WILL RETURN CONTROL TO THE ERROR
                                        ;CALL AT ERR2.

027406  012601                  MODDSUB:      MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS
027410  012700  000200                        MOV     #200,R0         ;SET FD MODE.
027414  170100                              LDFPS   R0
027416  010100                              MOV     R1,R0           ;SET UP AC0
027420  172410                              LDD     (R0),AC0
027422  012700  025666                      MOV     #MODP1,R0       ;PUT A BACKROUND PATTERN INTO AC1.
027426  172510                              LDD     (R0),AC1
027430  016100  000060                      MOV     60(R1),R0       ;SET UP THE FPS.
027434  170100                              LDFPS   R0
027436  012737  027452  001236              MOV     #1$,@#$TMP2
027444  010100                              MOV     R1,R0           ;COMPUTE THE ADDRESS OF THE FSRC.
027446  062700  000010                      ADD     #10,R0

027452  171410                  1$:         MODD    (R0),AC0        ;EXECUTE THE TEST INSTRUCTION.

027454  170204                              STFPS   R4              ;GET THE FPS.
027456  012700  000200                      MOV     #200,R0         ;SET FD MODE.
027462  170100                              LDFPS   R0
027464  012700  027764                      MOV     #MODDT0,R0      ;GET THE FRACTIONAL RESULT.
027470  174010                              STD     AC0,(R0)
027472  012700  027774                      MOV     #MODDT1,R0      ;GET THE INTEGER RESULT.
027476  174110                              STD     AC1,(R0)

027500  010102                              MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
027502  010237  001240                      MOV     R2,@#$TMP3
027506  062702  000010                      ADD     #10,R2
027512  010237  001242                      MOV     R2,@#$TMP4
027516  062702  000010                      ADD     #10,R2
027522  010237  001244                      MOV     R2,@#$TMP5
027526  062702  000010                      ADD     #10,R2
027532  010237  001246                      MOV     R2,@#$TMP6
027536  012737  027764  001250              MOV     #MODDT0,@#$TMP7
027544  012737  027774  001252              MOV     #MODDT1,@#$TMP10
027552  016137  000062  001256              MOV     62(R1),@#$TMP12
027560  010437  001254                      MOV     R4,@#$TMP11

027564  012702  027764                      MOV     #MODDT0,R2      ;CHECK THE FRACTIONAL RESULT.
027570  010103                              MOV     R1,R3
027572  062703  000020                      ADD     #20,R3
027576  012705  000004                      MOV     #4,R5
027602  022223                  2$:         CMP     (R2)+,(R3)+
027604  001020                              BNE     10$             ;BRANCH IF INCORRECT.
027606  077503                              SOB     R5,2$

027610  012702  027774                      MOV     #MODDT1,R2      ;CHECK THE INTEGER RESULT.
027614  010103                              MOV     R1,R3
027616  062703  000030                      ADD     #30,R3
027622  012705  000004                      MOV     #4,R5
```

```
4786 027626  022223                3$:     CMP     (R2)+,(R3)+
4787 027630  001026                        BNE     15$             ;BRANCH IF INCORRECT.
4788 027632  077503                        SOB     R5,3$
4789
4790
4791 027634  026104  000062                CMP     62(R1),R4       ;CHECK THE FPS.
4792 027640  001042                        BNE     20$             ;BRANCH IF INCORRECT.
4793
4794 027642  000161  000072          9$:     JMP     72(R1)          ;RETURN.
4795
4796                                ;FRACTIONAL ERROR.
4797 027646  012702  027764          10$:    MOV     #MODDT0,R2      ;WAS THE FRACTIONAL ERROR ANTICIPATED?
4798 027652  010103                        MOV     R1,R3
4799 027654  062703  000040                ADD     #40,R3
4800 027660  012705  000004                MOV     #4,R5
4801 027664  022223                50$:    CMP     (R2)+,(R3)+
4802 027666  001005                        BNE     11$             ;BRANCH IF NOT ANTICIPATED.
4803 027670  077503                        SOB     R5,50$
4804 027672  010102                        MOV     R1,R2           ;THE ERROR WAS ANTICIPATED SO
4805 027674  062702  000064                ADD     #64,R2          ;RETURN TO THE ERROR REPORT AT THE
4806                                                               ;CALLING ROUTINE.
4807 027700  000112                        JMP     (R2)
4808
4809 027702                        11$:                            ;THE ERROR WAS NOT ANTICIPATED SO
4810 027702  104070                12$:    ERROR   +70             ;REPORT THE INCORRECT FRACTION HERE.
4811 027704  000756                        BR      9$
4812
4813                                ;INTEGFR ERROR.
4814 027706  012702  027774          15$:    MOV     #MODDT1,R2      ;WAS THE INTEGER ERROR ANTICIPATED?
4815 027712  010103                        MOV     R1,R3
4816 027714  062703  000050                ADD     #50,R3
4817 027720  012705  000004                MOV     #4,R5
4818 027724  022223                60$:    CMP     (R2)+,(R3)+
4819 027726  001005                        BNE     17$             ;BRANCH IF NOT ANTICIPATED.
4820 027730  077503                        SOB     R5,60$
4821 027732  010102                        MOV     R1,R2           ;THE ERROR WAS ANTICIAPTED SO RETURN
4822 027734  062702  000070                ADD     #70,R2          ;TO THE ERROR REPORT IN THE CALLING
4823                                                               ;ROUTINE.
4824 027740  000112                        JMP     (R2)
4825
4826 027742                        16$:                            ;THE ERROR WAS NOT ANTICIPATED SO REPORT
4827 027742  104071                17$:    ERROR   +71             ;THE INTEGER FAILURE HERE.
4828 027744  000736                        BR      9$
4829
4830                                ;FPS INCORRECT.
4831 027746  010437  001254          20$:    MOV     R4,@#$TMP11     ;REPORT INCORRECT FPS.
4832 027752  016137  000062  001256        MOV     62(R1),@#$TMP12
4833 027760  104072                21$:    ERROR   +72
4834 027762  000727                        BR      9$
4835
4836 027764  000000  000000  000000  MODDT0: .WORD   0,0,0,0
     027772  000000
4837
4838 027774  000000  000000  000000  MODDT1: .WORD   0,0,0,0
     030002  000000
4839
4840 030004                        HHHDONE:
```

```
        030004  104412                          RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                        ;SEE IF THE USER HAS EXPRESSED
                                                                        ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                        ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                        ;THE USER TYPED CONTROL G?).
  4841
  4842
  4843
  4851
  4852                                          ;TEST TITLE:UNDER/OVERFLOW, USING MODF WITH TRAPS DISABLED
  4853                                  ;;*****************************************************************
                                        ;*TEST 20        SEE COMMENT ABOVE FOR TEST TITLE
                                        ;*
                                        ;*THIS IS A TEST OF THE MODF OVERFLOW AND UNDERFLOW CONDITIONS. IT MAKES
                                        ;*USE OF A SUBROUTINE TO SETUP THE OPERANDS, EXECUTE THE MODF INSTRUCTION
                                        ;*AND CHECK THE RESULTS. TRAPS ARE DISABLED DURING THIS TEST.
                                        ;*
                                        ;;*****************************************************************
        030006  000004                  TST20:  SCOPE
  4854
  4855                                  ;UNDERFLOW TEST, WITH EXPONENT OF THE RESULT = -129, FIU - 1, FID - 1
  4856 030010                           MMM1:
        030010  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
  4857 030012  004767  000320                  JSR     PC,MODFOV
  4858 030016  020123  045676           1$:     .WORD   20123,45676     ;AC
  4859 030022  020200  000000           2$:     .WORD   20200,0         ;FSRC
  4860 030026  000123  045676           3$:     .WORD   123,45676       ;FRACTIONAL RES.
  4861 030032  000000  000000           4$:     .WORD   0,0             ;INTEGER RES.
  4862 030036  177777  177777           5$:     .WORD   -1,-1           ;ERROR FRACTIONAL RES.
  4863 030042  177777  177777           6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
  4864 030046  042000                   7$:     42000                   ;FPS BEFORE EXECUTION.
  4865 030050  142004                           142004                  ;FPS AFTER EXECUTION.
  4866 030052  000012                           12                      ;FEC
  4867 030054  104170                   8$:     ERROR   +170            ;FEC INCORRECT, UNDERFLOW.
  4868 030056  000401                           BR      9$
  4869 030060  104171                           ERROR   +171            ;AC V 1 (2,3) <= ZERO, ST 126.
  4870 030062                           9$:
  4871
  4872                                  ;UNDERFLOW EXP OF RESULT = -193, FIU - 0, FID - 1
  4873 030062                           MMM2:
        030062  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
  4874 030064  004737  030336                  JSR     PC,@#MODFOV
  4875 030070  010200  000000           1$:     .WORD   10200,0         ;AC
  4876 030074  010000  000000           2$:     .WORD   10000,0         ;FSRC
  4877 030100  000000  000000           3$:     .WORD   0,0             ;FRACTIONAL RES.
  4878 030104  000000  000000           4$:     .WORD   0,0             ;INTEGER RES.
  4879 030110  177777  177777           5$:     .WORD   -1,-1           ;ERROR FRACTIONAL RES.
  4880 030114  177777  177777           6$:     .WORD   -1,-1           ;ERROR INTEGER RES.
  4881 030120  005013                   7$:     5013                    ;FPS BEFORE EXECUTION.
  4882 030122  005004                           5004                    ;FPS AFTER EXECUTION.
  4883 030124  000012                           12                      ;FEC
  4884 030126  000240                   8$:     NOP
  4885 030130  000401                           BR      9$
  4886 030132  104171                           ERROR   +171
  4887 030134                           9$:
  4888
  4889                                  ;OVERFLOW TEST WITH EXPONENT OF THE RESULT = 128, FIV = 1, FID = 1
```

```
4890 030134                          MMM3:
     030134  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4891 030136  004737  030336                  JSR     PC,@#MODFOV
4892 030142  060052  125252          1$:     .WORD   60052,125252    ;AC
4893 030146  060200  000000          2$:     .WORD   60200,0         ;FSRC
4894 030152  000000  000000          3$:     .WORD   0,0             ;FRACTIONAL RES.
4895 030156  000052  125252          4$:     .WORD   52,125252       ;INTEGER RES.
4896 030162  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
4897 030166  000000  000000          6$:     .WORD   0,0             ;ERROR INTEGER RES.
4898 030172  041000                  7$:     41000                   ;FPS BEFORE EXECUTION.
4899 030174  141006                          141006                  ;FPS AFTER EXECUTION.
4900 030176  000010                          10                      ;FEC
4901 030200  104172                  8$:     ERROR   +172            ;BAD FEC ON OVERFLOW.
4902 030202  000401                          BR      9$
4903 030204  104173                          ERROR   +173            ;ST 520 TO STORE ZERO TWICE
4904                                                                 ;INTO 162
4905 030206                          9$:
4906
4907                                 ;OVERFLOW TEST WITH EXPONENT OF THE RESULT - 130, FIV   0, FID   1
4908 030206                          MMM4:
     030206  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4909 030210  004737  030336                  JSR     PC,@#MODFOV
4910 030214  060345  067654          1$:     .WORD   60345,67654     ;AC
4911 030220  060200  000000          2$:     .WORD   60200,0         ;FSRC
4912 030224  000000  000000          3$:     .WORD   0,0             ;FRACTIONAL RES.
4913 030230  000000  000000          4$:     .WORD   0,0             ;INTEGER RES.
4914 030234  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
4915 030240  000345  067654          6$:     .WORD   345,67654       ;ERROR INTEGER RES.
4916 030244  006011                  7$:     6011                    ;FPS BEFORE EXECUTION.
4917 030246  006006                          6006                    ;FPS AFTER EXECUTION.
4918 030250  000010                          10                      ;FEC
4919 030252  000240                  8$:     NOP
4920 030254  000401                          BR      9$
4921 030256  104174                          ERROR   +174            ;ST 520 TO 162 INTO STORE ZERO TWICE.
4922 030260                          9$:
4923
4924                                 ;OVERFLOW TEST WITH EXPONENT OF THE RESULT - 128, RESULT NEGATIVE
4925                                 ;AND FIV = 1, FID = 1
4926 030260                          MMM5:
     030260  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
4927 030262  004737  030336                  JSR     PC,@#MODFOV
4928 030266  160252  125252          1$:     .WORD   160252,125252   ;AC
4929 030272  060000  000000          2$:     .WORD   60000,0         ;FSRC
4930 030276  000000  000000          3$:     .WORD   0,0             ;FRACTIONAL RES.
4931 030302  100052  125252          4$:     .WORD   100052,125252   ;INTEGER RES.
4932 030306  000000  000000          5$:     .WORD   0,0             ;ERROR FRACTIONAL RES.
4933 030312  000052  125252          6$:     .WORD   52,125252       ;ERROR INTEGER RES.
4934 030316  041000                  7$:     41000                   ;FPS BEFORE EXECUTION.
4935 030320  141006                          141006                  ;FPS AFTER EXECUTION.
4936 030322  000010                          10                      ;FEC
4937 030324  104172                  8$:     ERROR   +172
4938 030326  000401                          BR      9$
4939 030330  104175                          ERROR   +175            ;ST 517, BAD SIGN.
4940 030332  000137  030732          9$:     JMP     @#MMMDONE       ;GO TO THE NEXT TEST.
4941
4942                                 ;THIS SUBROUTINE, MODFOV, IS CALLED TO SETUP THE
4943                                 ;OPERANDS, EXECUTE THE MODF INSTRUCTION AND CHECK THE RESULTS.
```

```
                                ;IT IS CALLED THUS:
                                ;
                                ;               ACARG:   .WORD   X,X            ;AC OPERAND
                                ;               FSRCARG:.WORD    X,X            ;FSRC OPERAND
                                ;               FRES:    .WORD   X,X            ;FRACTIONAL RESULT
                                ;               INTRES:  .WORD   X,X            ;INTEGER RESULT
                                ;               ERFRES:  .WORD   X,X            ;ERROR FRACTION RESULT
                                ;               ERINTRES:.WORD   X,X            ;ERROR INTEGER RESULT
                                ;               FPSB:    .WORD   X              ;FPS BEFORE EXECUTION
                                ;               FPSA:    .WORD   X              ;FPS AFTER EXECUTION
                                ;               FEC:     .WORD   X              ;FEC
                                ;               ERR1:    ERROR   +X             ;FEC ERROR
                                ;                        BR      CONT
                                ;               ERR2:    ERROR   +X             ;INTEGER ERROR
                                ;               CONT:                           ;RETURN ADDRESS
                                ;
                                ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC ARGUMENT). THE MODF
                                ;INSTRUCTION IS EXECUTED. THEN THE RESULTS ARE RETRIEVED.
                                ;THE FRACTION PART OF THE RESULT IS COMPARED WITH FRES. IF THIS IS CORRECT
                                ;THEN THE INTEGER PART IS COMPARED WITH INTRES. IF BOTH OF THESE ARE CORRECT
                                ;THEN THE FPS IS COMPARED WITH FPSA. AFTER EXECUTION IF NO ERRORS OCCURRED
                                ;THEN MODFOV WILL RETURN TO CONT. IF THE FPS WAS INCORRECT
                                ;IT IS REPORTED HERE. IF THE FRACTION IS INCORRECT IT IS COMPARED WITH
                                ;THE ANTICIPATED BAD FRACTION, ERFRES. IF THIS DOESN'T MATCH
                                ;THE TRUE RESULT THEN THE ERROR IS REPORTED HERE. IF THE ANTICIPATED
                                ;FAILURE MATCHES THE TRUE RESULT THEN  MODFOV PASSES CONTROL TO THE
                                ;ERROR CALL AT ERR1. LIKEWISE IF THE INTEGER PART OF THE RESULT IS
                                ;NOT CORRECT THEN IT IS COMPARED WITH THE ANTICIPATED INTEGER
                                ;FAILURE. IF THIS DOEN'T MATCH THEN THE ERROR IS REPORTED HERE.
                                ;IF A MATCH IS MADE HOWEVER, MODFOV WILL RETURN CONTROL TO THE ERROR
                                ;CALL AT ERR2.
                                
030336  012601          MODFOV: MOV     (SP)+,R1        ;GET A POINTER TO THE ARGUMENTS
030340  012700  000200          MOV     #200,R0         ;SET FD MODE.
030344  170100                  LDFPS   R0
030346  010100                  MOV     R1,R0           ;SET UP AC0
030350  172410                  LDD     (R0),AC0
030352  012700  025666          MOV     #MODP1,R0       ;PUT A BACKROUND PATTERN INTO AC1.
030356  172510                  DD      (R0),AC1
030360  016100  000030          MOV     30(R1),R0       ;SET UP THE FPS.
030364  170100                  LDFPS   R0
030366  012737  030402  001236  MOV     #1$,@#$TMP2
030374  010100                  MOV     R1,R0           ;COMPUTE THE ADDRESS OF THE FSRC.
030376  062700  000004          ADD     #4,R0

030402  171410          1$:     MODF    (R0),AC0        ;EXECUTE THE TEST INSTRUCTION.

030404  170204                  STFPS   R4              ;GET THE FPS.
030406  170305                  STST    R5              ;GET FEC.
030410  012700  000200          MOV     #200,R0         ;SET FD MODE.
030414  170100                  LDFPS   R0
030416  012700  030712          MOV     #MODFD0,R0      ;GET THE FRACTIONAL RESULT.
030422  174010                  STD     AC0,(R0)
030424  012700  030722          MOV     #MODFD1,R0      ;GET THE INTEGER RESULT.
030430  174110                  STD     AC1,(R0)

030432  010102                  MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
```

```
5001 030434  010237  001240                    MOV     R2,@#$TMP3
5002 030440  062702  000004                    ADD     #4,R2
5003 030444  010237  001242                    MOV     R2,@#$TMP4
5004 030450  062702  000004                    ADD     #4,R2
5005 030454  010237  001244                    MOV     R2,@#$TMP5
5006 030460  062702  000004                    ADD     #4,R2
5007 030464  010237  001246                    MOV     R2,@#$TMP6
5008 030470  012737  030712  001250            MOV     #MODFD0,@#$TMP7
5009 030476  012737  030722  001252            MOV     #MODFD1,@#$TMP10
5010 030504  010437  001254                    MOV     R4,@#$TMP11
5011 030510  016137  000032  001256            MOV     32(R1),@#$TMP12
5012 030516  010537  001260                    MOV     R5,@#$TMP13
5013 030522  016137  000034  001262            MOV     34(R1),@#$TMP14
5014
5015 030530  012702  030712                    MOV     #MODFD0,R2      ;CHECK THE FRACTIONAL RESULT.
5016 030534  026112  000010                    CMP     10(R1),(R2)
5017 030540  001025                            BNE     10$             ;BRANCH IF INCORRECT.
5018 030542  026162  000012  000002            CMP     12(R1),2(R2)
5019 030550  001021                            BNE     10$
5020
5021 030552  012702  030722                    MOV     #MODFD1,R2      ;CHECK THE INTEGER RESULT.
5022 030556  026112  000014                    CMP     14(R1),(R2)
5023 030562  001016                            BNE     15$             ;BRANCH  F INCORRECT.
5024 030564  026162  000016  000002            CMP     16(R1),2(R2)
5025 030572  001012                            BNE     15$
5026
5027 030574  026104  000032                    CMP     32(R1),R4       ;CHECK THE FPS.
5028 030600  001024                            BNE     20$             ;BRANCH IF INCORRECT.
5029
5030 030602  026105  000034                    CMP     34(R1),R5       ;CHECK THE FEC.
5031 030606  001C30                            BNE     25$             ;BRANCH IF INCORRECT.
5032
5033 030610  000161  000044          9$:       JMP     44(R1)          ;RETURN.
5034
5035                                ;FRACTIONAL ERROR.
5036 030614                         10$:                            ;THE ERROR WAS NOT ANTICIPATED SO
5037 030614  104165                12$:      ERROR   +165            ;REPORT THE INCORRECT FRACTION HERE.
5038 030616  000774                          BR      9$
5039
5040                                ;INTEGER ERROR.
5041 030620  026112  000024          15$:      CMP     24(R1),(R2)     ;WAS THIS ERROR ANTICIPATED?
5042 030624  001010                          BNE     16$             ;BRANCH IF NOT.
5043 030626  026162  000026  000002          CMP     26(R1),2(R2)
5044 030634  001004                          BNE     16$
5045 030636  010102                          MOV     R1,R2           ;THE ERROR WAS ANTICIAPTED SO RETURN
5046 030640  062702  000042                  ADD     #42,R2          ;TO THE ERROR REPORT IN THE CALLING
5047                                                                 ;ROUTINE.
5048 030644  000112                          JMP     (R2)
5049
5050 030646                         16$:                            ;THE ERROR WAS NOT ANTICIPATED SO REPORT
5051 030646  104166                17$:      ERROR   +166            ;THE INTEGER FAILURE HERE.
5052 030650  000757                          BR      9$
5053
5054                                ;FPS INCORRECT.
5055 030652  010437  001254          20$:      MOV     R4,@#$TMP11     ;REPORT INCORRECT FPS.
5056 030656  016137  000032  001256            MOV     32(R1),@#$TMP12
5057 030664  104167                21$:      ERROR   +167
```

```
 5058 030666  000750                          BR      9$
 5059
 5060                                 ;REPORT FEC ERROR.
 5061 030670  010537  001260          25$:    MOV     R5,@#$TMP13
 5062 030674  016137  000034  001262          MOV     34(R1),@#$TMP14
 5063 030702  010102                          MOV     R1,R2
 5064 030704  062702  000036                  ADD     #36,R2
 5065 030710  000112                          JMP     (R2)
 5066
 5067 030712  000000  000000  000000  MODFD0: .WORD   0,0,0,0
      030720  000000
 5068
 5069 030722  000000  000000  000000  MODFD1: .WORD   0,0,0,0
      030730  000000
 5070
 5071 030732                          MMMDONE:
      030732  104412                          RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                              ;SEE IF THE USER HAS EXPRESSED
                                              ;THE DESIRE TO CHANGE THE SOFTWARE
                                              ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                              ;THE USER TYPED CONTROL G?).
 5072
 5073
 5074
 5082
 5083                                 ;TEST TITLE:UNDER/OVERFLOW, USING MODD WITH TRAPS DISABLED
 5084                                 ;;*****************************************************************
                                      ;*TEST 21        SEE COMMENT ABOVE FOR TEST TITLE
                                      ;*
                                      ;*THIS IS A TEST OF THE MODD INSTRUCTION'S OVER FLOW AND UNDER FLOW
                                      ;*CONDITIONS. A SUBROUTINE IS USED TO SET UP THE OPERANDS, EXECUTE THE
                                      ;*MODD INSTUCTION AND CHECK THE RESULTS.
                                      ;*
                                      ;;*****************************************************************
      030734  000004                  TST21:  SCOPE
 5085
 5086                                 ;UNDERFLOW TEST WITH EXPONENT OF THE RESULT = -129, FIU - 1, FID - 1
 5087 030736                          NNN1:
      030736  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 5088 030740  004737  031352                  JSR     PC,@#MODDOV
 5089 030744  020252  125252          1$:     .WORD   20252,125252    ;AC
 5090 030750  125252  125252                  .WORD   125252,125252
 5091 030754  020100  000000  000000  2$:     .WORD   20100,0,0,0     ;FSRC
      030762  000000
 5092 030764  000177  177777  177777  3$:     .WORD   177,-1,-1,-1    ;FRACTIONAL RES.
      030772  177777
 5093 030774  000000  000000  000000  4$:     .WORD   0,0,0,0         ;INTEGER RES.
      031002  000000
 5094 031004  020252  125252          5$:     .WORD   20252,125252    ;ERROR FRACTIONAL RES.
 5095 031010  125252  125252                  .WORD   125252,125252
 5096 031014  000000  000000  177777  6$:     .WORD   0,0,-1,-1       ;ERROR INTEGER RES.
      031022  177777
 5097 031024  042200                  7$:     42200                   ;FPS BEFORE EXECUTION.
 5098 031026  142204                          142204                  ;FPS AFTER EXECUTION.
 5099 031030  000012                          12                      ;FEC
 5100 031032  104201                  8$:     ERROR   +201            ;FEC INCORRECT ON UNDERFLOW.
 5101 031034  000401                          BR      9$
```

```
                                        ERROR   +202            ;ST 155 (BUT FD)
                                9$:
                                
                                ;UNDERFLOW TEST WITH EXPONENT OF THE RESULT = -193, FIU - 0, FID - 1
                                NNN2:
                                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                        JSR     PC,@#MODDOV
                                1$:     .WORD   10000,0         ;AC
                                        .WORD   123456,0
                                2$:     .WORD   10200,0,0,0     ;FSRC
                                3$:     .WORD   0,0,0,0         ;FRACTIONAL RES.
                                4$:     .WORD   0,0,0,0         ;INTEGER RES.
                                5$:     .WORD   0,0,0,0         ;ERROR FRACTIONAL RES.
                                6$:     .WORD   0,0             ;ERROR INTEGER RES.
                                        .WORD   123456,0
                                7$:     5213                    ;FPS BEFORE EXECUTION.
                                        5204                    ;FPS AFTER EXECUTION.
                                        12
                                8$:     NOP
                                        BR      9$
                                        ERROR   +203            ;ST 047 (BUT FD).
                                9$:
                                
                                ;OVERFLOW TEST WITH EXPONENT OF THE RESULT = 128, FIV = 1, FID - 1
                                NNN3:
                                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                        JSR     PC,@#MODDOV
                                1$:     .WORD   60252,125252    ;AC
                                        .WORD   125252,125252
                                2$:     .WORD   60100,0,0,0     ;FSRC
                                3$:     .WORD   0,0,0,0         ;FRACTIONAL RES.
                                4$:     .WORD   177,-1,-1,-1    ;INTEGER RES.
                                5$:     .WORD   0,0,0,0         ;ERROR FRACTIONAL RES.
                                6$:     .WORD   177,-1          ;ERROR INTEGER RES.
                                        .WORD   125252,125252
                                7$:     41200                   ;FPS BEFORE EXECUTION.
                                        141206                  ;FPS AFTER EXECUTION.
                                        10                      ;FEC
                                8$:     ERROR   +204            ;FEC BAD ON OVERFLOW.
                                        BR      9$
                                        ERROR   +205            ;ST 520 TO 162 INTO 163 (BUT FD).
                                9$:
                                
                                ;OVERFLOW TEST WITH EXPONENT OF THE RESULT = 130, FIV = 0, FID   1
                                NNN4:
                                        LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                        JSR     PC,@#MODDOV
                                1$:     .WORD   60200,0         ;AC
                                        .WORD   125252,0
```

```
5148 031262  060200  000000  000000  2$:    .WORD   60200,0,0,0      ;FSRC
     031270  000000
5149 031272  000000  000000  000000  3$:    .WORD   0,0,0,0          ;FRACTIONAL RES.
     031300  000000
5150 031302  000000  000000  000000  4$:    .WORD   0,0,0,0          ;INTEGER RES.
     031310  000000
5151 031312  000000  000000  000000  5$:    .WORD   0,0,0,0          ;ERROR FRACTIONAL RES.
     031320  000000
5152 031322  000400  000000          6$:    .WORD   400,0            ;ERROR INTEGER RES.
5153 031326  125252  000000                 .WORD   125252,0
5154 031332  006211                  7$:    6211                     ;FPS BEFORE EXECUTION.
5155 031334  006206                         6206                     ;FPS AFTER EXECUTION.
5156 031336  000010                         10                       ;FEC
5157 031340  000240                  8$:    NOP
5158 031342  000401                         BR      9$
5159 031344  104206                         ERROR   +206             ;ST 520 TO 162 INTO STORE ZERO TWICE.
5160 031346  000137  031760          9$:    JMP     @#NNNDONE        ;GO TO NEXT TEST.
5161
5162                                 ;THIS SUBROUTINE, MODDOV, IS CALLED TO SETUP THE
5163                                 ;OPERANDS, EXECUTE THE MODD INSTRUCTION AND CHECK THE RESULTS.
5164                                 ;IT IS CALLED THUS:
5165                                 ;
5166                                 ;       ACARG:   .WORD   X,X,X,X         ;AC OPERAND
5167                                 ;       FSRCARG: .WORD   X,X,X,X         ;FSRC OPERAND
5168                                 ;       FRES:    .WORD   X,X,X,X         ;FRACTIONAL RESULT
5169                                 ;       INTRES:  .WORD   X,X,X,X         ;INTEGER RESULT
5170                                 ;       ERFRES:  .WORD   X,X,X,X         ;ERROR FRACTION RESULT
5171                                 ;       ERINTRES:.WORD   X,X,X,X         ;ERROR INTEGER RESULT
5172                                 ;       FPSB:    .WORD   X               ;FPS BEFORE EXECUTION
5173                                 ;       FPSA:    .WORD   X               ;FPS AFTER EXECUTION
5174                                 ;       ERR1:    ERROR   +X              ;FRACTION ERROR
5175                                 ;                BR      CONT
5176                                 ;       ERR2:    ERROR   +X              ;INTEGER ERROR
5177                                 ;       CONT:                            ;RETURN ADDRESS
5178                                 ;
5179                                 ;THE OPERANDS ARE SET UP (USING AC0 FOR THE AC ARGUMENT). THE MODD
5180                                 ;INSTRUCTION IS EXECUTED. THEN THE RESULTS ARE RETRIEVED.
5181                                 ;THE FRACTION PART OF THE RESULT IS COMPARED WITH FRES. IF THIS IS CORRECT
5182                                 ;THEN THE INTEGER PART IS COMPARED WITH INTRES. IF BOTH OF THESE ARE CORRECT
5183                                 ;THEN THE FPS IS COMPARED WITH FPSA. AFTER EXECUTION IF NO ERRORS OCCURRED
5184                                 ;THEN MODDOV WILL RETURN TO CONT. IF THE FPS WAS INCORRECT
5185                                 ;IT IS REPORTED HERE. IF THE FRACTION IS INCORRECT IT IS COMPARED WITH
5186                                 ;THE ANTICIPATED BAD FRACTION, ERFRES. IF THIS DOESN'T MATCH
5187                                 ;THE TRUE RESULT THEN THE ERROR IS REPORTED HERE. IF THE ANTICIPATED
5188                                 ;FAILURE MATCHES THE TRUE RESULT THEN  MODDOV PASSES CONTROL TO THE
5189                                 ;ERROR CALL AT ERR1. LIKEWISE IF THE INTEGER PART OF THE RESULT IS
5190                                 ;NOT CORRECT THEN IT IS COMPARED WITH THE ANTICIPATED INTEGER
5191                                 ;FAILURE. IF THIS DOEN'T MATCH THEN THE ERROR IS REPORTED HERE.
5192                                 ;IF A MATCH IS MADE HOWEVER, MODDOV WILL RETURN CONTROL TO THE ERROR
5193                                 ;CALL AT ERR2.
5194
5195 031352  012601                  MODDOV: MOV     (SP)+,R1         ;GET A POINTER TO THE ARGUMENTS
5196 031354  012700  000200                 MOV     #200,R0          ;SET FD MODE.
5197 031360  170100                         LDFPS   R0
5198 031362  010100                         MOV     R1,R0            ;SET UP AC0
5199 031364  172410                         LDD     (R0),AC0
5200 031366  012700  025666                 MOV     #MODP1,R0        ;PUT A BACKROUND PATTERN INTO AC1.
```

```
 5201 031372  172510                          LDD     (R0),AC1
 5202 031374  016100  000060                  MOV     60(R1),R0       ;SET UP THE FPS.
 5203 031400  170100                          LDFPS   R0
 5204 031402  012737  031416  001236          MOV     #1$,@#$TMP2
 5205 031410  010100                          MOV     R1,R0           ;COMPUTE THE ADDRESS OF THE FSRC.
 5206 031412  062700  000010                  ADD     #10,R0
 5207
 5208 031416  171410                  1$:     MODD    (R0),AC0        ;EXECUTE THE TEST INSTRUCTION.
 5209
 5210 031420  170305                          STST    R5              ;GET THE FPS.
 5211 031422  170204                          STFPS   R4              ;GET THE FPS.
 5212 031424  012700  000200                  MOV     #200,R0         ;SET FD MODE.
 5213 031430  170100                          LDFPS   R0
 5214 031432  012700  031740                  MOV     #MODDD0,R0      ;GET THE FRACTIONAL RESULT.
 5215 031436  174010                          STD     AC0,(R0)
 5216 031440  012700  031750                  MOV     #MODDD1,R0      ;GET THE INTEGER RESULT.
 5217 031444  174110                          STD     AC1,(R0)
 5218
 5219 031446  010102                          MOV     R1,R2           ;SAVE THE DATA IN CASE OF ERROR.
 5220 031450  010237  001240                  MOV     R2,@#$TMP3
 5221 031454  062702  000010                  ADD     #10,R2
 5222 031460  010237  001242                  MOV     R2,@#$TMP4
 5223 031464  062702  000010                  ADD     #10,R2
 5224 031470  010237  001244                  MOV     R2,@#$TMP5
 5225 031474  062702  000010                  ADD     #10,R2
 5226 031500  010237  001246                  MOV     R2,@#$TMP6
 5227 031504  012737  031740  001250          MOV     #MODDD0,@#$TMP7
 5228 031512  012737  031750  001252          MOV     #MODDD1,@#$TMP10
 5229 031520  010437  001254                  MOV     R4,@#$TMP11
 5230 031524  016137  000062  001256          MOV     62(R1),@#$TMP12
 5231 031532  010537  001260                  MOV     R5,@#$TMP13
 5232 031536  016137  000064  001262          MOV     64(R1),@#$TMP14
 5233
 5234 031544  012702  031740                  MOV     #MODDD0,R2      ;CHECK THE FRACTIONAL RESULT.
 5235 031550  010103                          MOV     R1,R3
 5236 031552  062703  000020                  ADD     #20,R3
 5237 031556  012700  000004                  MOV     #4,R0
 5238 031562  022223                  2$:     CMP     (R2)+,(R3)+
 5239 031564  001023                          BNE     10$             ;BRANCH IF INCORRECT.
 5240 031566  077003                          SOB     R0,2$
 5241
 5242 031570  012702  031750                  MOV     #MODDD1,R2      ;CHECK THE INTEGER RESULT.
 5243 031574  010103                          MOV     R1,R3
 5244 031576  062703  000030                  ADD     #30,R3
 5245 031602  012700  000004                  MOV     #4,R0
 5246 031606  022223                  3$:     CMP     (R2)+,(R3)+
 5247 031610  001013                          BNE     15$             ;BRANCH IF INCORRECT.
 5248 031612  077003                          SOB     R0,3$
```

```
5250
5251
5252 031614  026104  000062                  CMP     62(R1),R4       ;CHECK THE FPS.
5253 031620  001027                          BNE     20$             ;BRANCH IF INCORRECT.
5254
5255 031622  026105  000064                  CMP     64(R1),R5       ;CHECK THE FEC.
5256 031626  001033                          BNE     25$
5257
5258 031630  000161  000074          9$:     JMP     74(R1)          ;RETURN.
5259
5260                               ;FRACTIONAL ERROR.
5261 031634                        10$:                            ;THE ERROR WAS NOT ANTICIPATED SO
5262 031634  104176                12$:    ERROR   +176            ;REPORT THE INCORRECT FRACTION HERE.
5263 031636  000774                        BR      9$
5264
5265                               ;INTEGER ERROR.
5266 031640  012702  031750          15$:    MOV     #MODDD1,R2      ;WAS THE INTEGER ERROR ANTICIPATED?
5267 031644  010103                        MOV     R1,R3
5268 031646  062703  000050                ADD     #50,R3
5269 031652  012705  000004                MOV     #4,R5
5270 031656  022223                60$:    CMP     (R2)+,(R3)+
5271 031660  001005                        BNE     17$             ;BRANCH IF NOT ANTICIPATED.
5272 031662  077503                        SOB     R5,60$
5273 031664  010102                        MOV     R1,R2           ;THE ERROR WAS ANTICIAPTED ,SO RETURN
5274 031666  062702  000072                ADD     #72,R2          ;TO THE ERROR REPORT IN THE CALLING
5275                                                               ;ROUTINE.
5276 031672  000112                        JMP     (R2)
5277
5278 031674                        16$:                            ;THE ERROR WAS NOT ANTICIPATED SO REPOR
5279 031674  104177                17$:    ERROR   +177            ;THE INTEGER FAILURE HERE.
5280 031676  000754                        BR      9$
5281
5282                               ;FPS INCORRECT.
5283 031700  010437  001254          20$:    MOV     R4,@#$TMP11     ;REPORT INCORRECT FPS.
5284 031704  016137  000062  001256          MOV     62(R1),@#$TMP12
5285 031712  104200                21$:    ERROR   +200
5286 031714  000745                        BR      9$
5287
5288                               ;REPORT FEC ERROR.
5289 031716  010537  001260          25$:    MOV     R5,@#$TMP13
5290 031722  016137  000064  001262          MOV     64(R1),@#$TMP14
5291 031730  010102                        MOV     R1,R2
5292 031732  062702  000066                ADD     #66,R2
5293 031736  000112                        JMP     (R2)
5294
5295 031740  000000  000000  000000  MODDD0: .WORD   0,0,0,0
     031746  000000
5296
5297 031750  000000  000000  000000  MODDD1: .WORD   0,0,0,0
     031756  000000
5298
5299 031760                        NWNDONE:
     031760  104412                        RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                   ;SEE IF THE USER HAS EXPRESSED
                                                                   ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                   ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                   ;THE USER TYPED CONTROL G?).
```

```
 5300
 5342
 5343
                        ;*****************************************************************
                        ;*TEST 22       INTERRUPT CORRECT FLOWS TEST
                        ;*
                        ;*THIS IS A TEST OF THE 'CORRECT' FLOWS. THIS PART OF THE MICRO CODE
                        ;*HAS AS ITS PURPOSE INSURING THAT INTERRUPT REQUESTS MADE DURING
                        ;*CERTAIN LENGTHY FPP INSTRUCTIONS GET HONORED. THIS IS DONE
                        ;*IN A WAY SUCH THAT IF AN INTERRUPT REQUEST OCCURS DURING ONE
                        ;*OF THESE INSTRUCTIONS THE STATE OF THAT INSTRUCTION'S
                        ;*EXECUTION WILL BE THE SAME AS IF THAT INSTRUCTION HAD NEVER
                        ;*BEEN FETCHED AND ITS EXECUTION NEVER STARTED. THUS THE MICRO CODE
                        ;*WILL RESTORE ALL REGISTERS, BACK UP THE PC AND LEAVE THE
                        ;*FPS AND AC0 THROUGH AC5 UNMODIFIED.
                        ;*THE INSTRUCTIONS FOR WHICH THIS IS NECESSARY ARE:
                        ;*       ADD (OR SUB)
                        ;*       DIV
                        ;*       MUL
                        ;*       MOD
                        ;*(BOTH DOUBLE AND FLOATING)
                        ;*ALL ADDRESSING MODES WILL BE TRIED WITH THE ADDD INSTRUCTION. THEN
                        ;*EACH OF THE OTHER INSTRUCTIONS WILL BE TRIED USING MODE 1.
                        ;*NOTE THAT THIS TEST NEEDS A SPECIAL INTERRUPT MODULE,
                        ;*WHICH WILL PROBABLY ONLY BE PRESENT IN DEC'S MANUFACTURING ENVIRONMENT,
                        ;*TO RUN. THIS SPECIAL EQUIPMENT IS DESIGNED TO RAISE AN
                        ;*INTERRUPT REQUEST IN THE PROCESSOR IF A BIT IS SET IN ITS STATUS
                        ;*REGISTER AND ONLY WHEN AN FPP INSTRUCTION IS ENCOUNTERED.
                        ;*THEREFORE THIS TEST WILL BE RUN CONDITIONALLY (DEPENDENT UPON WHETHER
                        ;*OR NOT THE STATUS REGISTER OF THE TEST EQUIPMENT TIMES OUT WHEN REFERENCED).
                        ;*THIS TEST CAN ALSO BE DESELECTED BY TURNING SWITCH 7 OF THE
                        ;*SWITCH REGISTER (PHYSICAL OR VIRTUAL) ON.
                        ;*THE TEST ASSUMES THAT THE TEST EQUIPMENT'S STATUS REGISTER IS AT
                        ;*LOCATION 777774 (NOTE THAT ALL REFERENCES TO THIS LOCATION ARE
                        ;*MADE INDIRECT THROUGH THIS PROGRAMS LOCATION CORINT, SO THAT
                        ;*IF THE USER HAS MODIFIED THE TEST EQUIPMENT'S STATUS REGISTER TO
                        ;*RESPOND TO A DIFFERENT ADDRESS LOCATION CORINT MUST BE
                        ;*MADE TO CONTAIN THAT STATUS REGISTER'S NEW ADDRESS).
                        ;*THIS PROGRAM ASSUMES THAT THE TRAP VECTOR FOR THE TEST EQUIPMENT IS 110.
                        ;*AGAIN NOTE THAT ALL REFERENCES TO THIS TRAP VECTOR ARE INDIRECT, THROUGH
                        ;*THIS PROGRAM'S LOCATION CORTRP (IF THE TEST EQUIPMENT IS
                        ;*MADE TO TRAP TO A DIFFERENT VECTOR LOCATION CORTRP MUST CONTAIN THE
                        ;*ADDRESS OF THIS VECTOR).
                        ;*
                        ;*****************************************************************
    031762  000004      TST22:  SCOPE
 5344
 5345 031764  132767  000200  147345        BITB    #200,$ENVM      ;SEE IF APT IS SELECTING TEST.
 5346 031772  001406                        BEQ     COR1            ;BRANCH TO AUTOSIZE IF NOT.
 5347 031774  032777  000200  147136        BIT     #200,@SWR       ;SEE IF THE USER HAS SELECTED THIS
 5348                                                                ;TEST USING THE SWITCH REGISTER.
 5349 032002  001022                        BNE     COR3            ;IF SO, PERFORM TEST.
 5350 032004  000137  033142                JMP     @#CORDONE       ;ELSE DO NOT RUN TEST.
 5351
 5352 032010  012737  032034  000004  COR1:   MOV     #COR2,@#ERRVECT ;SEE IF THE TEST EQUIPMENT'S STATUS
 5353 032016  012777  000000  001112        MOV     #0,@CORINT      ;REGISTER TIMES OUT.
 5354 032024  012737  036712  000004        MOV     #CPSPUR,@#ERRVECT
 5355 032032  000406                        BR      COR3            ;DIDN'T TIME OUT SO START TEST.
```

```
                                    COR2:   CMP     (SP)+,(SP)+     ;IF THE REFERENCE TIMES OUT DO
                                            MOV     #CPSPUR,@#ERRVECT
                                            JMP     @#CORDONE       ;NOT RUN TEST.

                                    ;TEST ADDD MODE 0
                                    COR3:
                                            INC     #-1
                                            BNE     COR33
                                            TYPE
                                            .WORD   CORMES
                                    COR33:
                                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                            JSR     PC,@#CORSUB
                                    1$:     .WORD   40200,100,200,300       ;AC0
                                    2$:     .WORD   123456          ;R0
                                    3$:     200                     ;FPS
                                    4$:     ADDD    AC0,AC0         ;TEST INSTRUCTION.
                                            NOP
                                            CLR     @#CORFLG        ;RESET INTERRUPT FLAG
                                            ERROR   +252            ;NO INTERRUPT! TEST EQUIPMENT FAILED.
                                            BR      11$
                                    5$:     ERROR   +253            ;INCORRECT STATE AT INTERRUPT.
                                    11$:
                                    ;TEST ADD MODE 1
                                    COR4:
                                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                            JSR     PC,@#CORSUB
                                    1$:     .WORD   40201,555,77007,111111  ;AC0
                                    2$:     .WORD   1$              ;R0
                                    3$:     217                     ;FPS
                                    4$:     ADDD    (R0),AC0        ;TEST INSTRUCTION
                                            NOP
                                            CLR     @#CORFLG        ;RESET INTERRUPT FLAG
                                            ERROR   +252            ;REPORT FAILURE. NO INTERRUPT.
                                            BR      11$
                                            ERROR   +254
                                    11$:

                                    ;TEST ADDD MODE 2
                                    COR5:
                                            LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
                                            JSR     PC,@#CORSUB
                                    1$:     .WORD   40202,111333,52525,70707        ;AC0
                                    2$:     .WORD   1$              ;R0
                                    3$:     205                     ;FPS
                                    4$:     ADDD    (R0)+,AC0       ;TEST INSTRUCTION
                                            NOP
                                            CLR     @#CORFLG        ;RESET THE INTERRUPT FLAG
                                            ERROR   +252            ;REPORT FAILURE. NO INTERRUPT.
                                            BR      11$
                                            ERROR   +255            ;CORRECT FLOWS FAILED.
                                    11$:
```

```
                                        ;TEST ADDD MODE 3
                                        COR6:
                                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
032224  004737  032642                          JSR     PC,@#CORSUB
032230  040203  071735  072746      1$:       .WORD   40203,71735,72746,1     ;AC0
032236  000001
032240  032264                      2$:       .WORD   10$             ;R0
032242  000206                      3$:       206                     ;FPS
032244  172030                      4$:       ADDD    @(R0)+,AC0      ;TEST INSTRUCTION
032246  000240                                NOP
032250  005037  033124                        CLR     @#CORFLG                ;RESET THE INTERRUPT FLAG
032254  104252                                ERROR   +252            ;REPORT FAILURE, NO INTERRUPT.
032256  000403                                BR      11$
032260  104256                      5$:       ERROR   +256            ;CORRECT FLOWS FAILED.
032262  000401                                BR      11$
032264  032230                      10$:      .WORD   1$              ;USED FOR THE ADDRESSING OF THE OPERAND
                                                                      ;IN THIS MODE.
032266                              11$:
                                        ;TEST ADDD MODE 4
032266                                  COR7:
                                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
032270  004737  032642                          JSR     PC,@#CORSUB
032274  040204  123456  070123      1$:       .WORD   40204,123456,70123,45671        ;AC0
032302  045671
032304  032304                      2$:       .WORD   1$+10           ;R0
032306  000212                      3$:       212                     ;FPS
032310  172040                      4$:       ADDD    -(R0),AC0       ;TEST INSTRUCTION
032312  000240                                NOP
032314  005037  033124                        CLR     @#CORFLG        ;RESET THE INTERRUPT FLAG
032320  104252                                ERROR   +252            ;REPORT FAILURE. NO INTERRUPT.
032322  000401                                BR      11$
032324  104257                                ERROR   +257            ;CORRECT FLOWS FAILED
032326                          11$:
                                        ;TEST ADDD MODE 5
032326                                  COR8:
                                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
032330  004737  032642                          JSR     PC,@#CORSUB
032334  040205  076543  021076      1$:       .WORD   40205,76543,21076,54321 ;AC0
032342  054321
032344  032372                      2$:       .WORD   10$+2           ;R0
032346  000213                      3$:       213                     ;FPS
032350  172050                      4$:       ADDD    @-(R0),AC0      ;TEST INSTRUCTION
032352  000240                                NOP
032354  005037  033124                        CLR     @#CORFLG        ;RESET THE INTERRUPT FLAG
032360  104252                                ERROR   +252            ;REPORT ERROR. NO INTERRUPT.
032362  000403                                BR      11$
032364  104260                      5$:       ERROR   +260            ;CORRECT FLOWS FAILED.
032366  000401                                BR      11$
032370  032334                      10$:      .WORD   1$
032372                              11$:
                                        ;TEST ADDD MODE 6
032372                                  COR9:
                                                LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
032374  004737  032642                          JSR     PC,@#CORSUB
032400  040206  034353  063730      1$:       .WORD   40206,34353,63730,31323 ;AC0
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                032406  031323
 5458           032410  032377                  2$:     .WORD   1$-1            ;R0
 5459           032412  000214                  3$:     214                     ;FPS
 5460           032414  172060  000001          4$:     ADDD    1(R0),AC0       ;TEST INSTRUCTION
 5461           032420  005037  033124                  CLR     @#CORFLG
 5462           032424  104252                          ERROR   +252            ;REPORT FAILURE NO TRAP.
 5463           032426  000401                          BR      11$
 5464           032430  104261                  5$:     ERROR   +261
 5465           032432                          11$:
 5466
 5467                                           ;TEST ADDD MODE 7
 5468           032432                          COR10:
                032432  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 5469           032434  004737  032642                  JSR     PC,@#CORSUB
 5470           032440  040210  070107  062426  1$:     .WORD   40210,70107,62426,55555 ;AC0
                032446  055555
 5471           032450  032473                  2$:     .WORD   10$-1           ;R0
 5472           032452  000204                  3$:     204                     ;FPS
 5473           032454  172070  000001          4$:     ADDD    @1(R0),AC0      ;TEST INSTRUCTION
 5474           032460  005037  033124                  CLR     @#CORFLG
 5475           032464  104252                          ERROR   +252            ;REPORT FAILURE NO TRAP
 5476           032466  000403                          BR      11$
 5477           032470  104262                  5$:     ERROR   +262            ;CORRECT FLOWS FAILED.
 5478           032472  000401                          BR      11$
 5479           032474  032440                  10$:    .WORD   1$
 5480           032476                          11$:
 5481
 5482                                           ;TEST DIVD MODE 1
 5483           032476                          COR11:
                032476  104413                          LPERR                   SET UP THE LOOP ON ERROR ADDRESS.
 5484           032500  004737  032642                  JSR     PC,@#CORSUB
 5485           032504  040211  033445  056677  1$:     .WORD   40211,33445,56677,001122        ;AC0
                032512  001122
 5486           032514  032504                  2$:     .WORD   1$              ;R0
 5487           032516  000205                  3$:     205                     ;FPS
 5488           032520  174410                  4$:     DIVD    (R0),AC0        ;TEST INSTRUCTION
 5489           032522  000240                          NOP
 5490           032524  005037  033124                  CLR     @#CORFLG
 5491           032530  104252                          ERROR   +252            ;REPORT FAILURE, NO TRAP.
 5492           032532  000401                          BR      11$
 5493           032534  104263                  5$:     ERROR   +263            ;CORRECT FLOWS FAILED.
 5494           032536                          11$:
 5495
 5496                                           ;TEST MULD MODE 1
 5497           032536                          COR12:
                032536  104413                          LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
 5498           032540  004737  032642                  JSR     PC,@#CORSUB
 5499           032544  040212  165411  046252  1$:     .WORD   40212,165411,46252,63650        ;AC0
                032552  063650
 5500           032554  032544                  2$:     .WORD   1$              ;R0
 5501           032556  000210                  3$:     .WORD   210             ;FPS
 5502           032560  171010                  4$:     MULD    (R0),AC0        ;TEST INSTRUCTION
 5503           032562  000240                          NOP
 5504           032564  005037  033124                  CLR     @#CORFLG
 5505           032570  104252                          ERROR   +252            ;REPORT FAILURE, NO TRAP.
 5506           032572  000401                          BR      11$
 5507           032574  104264                  5$:     ERROR   +264            ;CORRECT FLOWS FAILED.
```

```
5508 032576                                  11$:
5509
5510                                         ;TEST MODD MODE 1
5511 032576                                  COR13:
     032576  104413                                 LPERR                   ;SET UP THE LOOP ON ERROR ADDRESS.
5512 032600  004737  032642                         JSR     PC,@#CORSUB
5513 032604  040213  045654  054542  1$:      .WORD   40213,45654,54542,171623        ;AC0
     032612  171623
5514 032614  032604                        2$:      .WORD   1$              ;R0
5515 032616  000412                        3$:      .WORD   412             ;FPS
5516 032620  171410                        4$:      MODD    (R0),AC0        ;TEST INSTRUCTION.
5517 032622  000240                                 NOP
5518 032624  005037  033124                         CLR     @#CORFLG
5519 032630  104252                                 ERROR   +252            ;REPORT FAILURE NO TRAP.
5520 032632  000401                                 BR      11$
5521 032634  104265                        5$:      ERROR   +265            ;CORRECT FLOWS FAILED.
5522 032636  000137  033142                 11$:     JMP     @#CORDONE       ;FINISHED TEST!
5523
5524                                         ;THIS SUBROUTINE, CORSUB, IS CALLED TO SET UP THE OPERANDS
5525                                         ;AND CHECK THE RESULTS IN THIS TEST. IT IS CALLED THUS:
5526                                         ;
5527                                         ;               JSR     PC,@#CORSUB
5528                                         ;       1$:     .WORD   X,X,X,X         ;AC0 OPERAND
5529                                         ;       2$:     .WORD   X               ;R0
5530                                         ;       3$:     .WORD   X               ;FPS
5531                                         ;       4$:     INST                    ;TEST INSTRUCTION TO BE
5532                                         ;                                       ;EXECUTED.
5533                                         ;               ADR                     ;AN ADDRESS OFFSET FOR
5534                                         ;                                       ;CERTAIN MODES OR NOP.
5535                                         ;               ERROR   +252            ;NO TRAP ERROR.
5536                                         ;               BR      11$
5537                                         ;       5$:     ERROR   +N              ;CORRECT FLOWS FAILURE.
5538                                         ;               BR      11$             ;OPTIONAL FOR CERTAIN MODES.
5539                                         ;       10$:    .WORD   ADDRESS         ;OPTIONAL FOR CERTAIN MODES.
5540                                         ;       11$:
5541                                         ;
5542                                         ;CORSUB WILL PICK UP A POINTER TO THE ARGUMENTS, IN R1. AC0, R0 AND
5543                                         ;THE FPS WILL BE SET TO THE DESIGNATED VALUES. THEN THE TEST MODULE
5544                                         ;WILL BE SET UP TO INTERRUPT AND THE INSTRUCTION AT 4$ EXECUTED. IF
5545                                         ;NO TRAP OCCURS THEN THE TEST MODULE IS FAULTY. WHEN THE TRAP OCCURS
5546                                         ;THE PC ON THE STACK SHOULD BE 4$, AND AC0, R0 AND THE FPS SHOULD NOT
5547                                         ;HAVE BEEN MODIFIED. IF EVERYTHING IS CORRECT CORSUB WILL RETURN TO
5548                                         ;5$ PLUS TWO. IF AN ERROR IS DETECTED THEN CORSUB WILL RETURN TO THE
5549                                         ;ERROR REPORT AT 5$.
5550                                         ;NOTE THAT A FLAG, CORFLG, IS SET TO -1 WHEN AN INTERRUPT IS PENDING.
5551                                         ;CORFLG IS ZERO OTHERWISE.
5552
5553 032642  005037  033124          CORSUB: CLR     @#CORFLG                ;SET FLAG TO INDICATE NO INTERRUPT
5554                                                                         ;PENDING.
5555 032646  012601                         MOV     (SP)+,R1                ;GET A POINTER TO THE ARGUMENTS.
5556 032650  010102                         MOV     R1,R2                   ;SET AC0.
5557 032652  012700  000200                 MOV     #200,R0
5558 032656  170100                         LDFPS   R0
5559 032660  172412                         LDD     (R2),AC0
5560 032662  016100  000012                 MOV     12(R1),R0               ;SET UP THE FPS.
5561 032666  170100                         LDFPS   R0
5562 032670  016100  000010                 MOV     10(R1),R0               ;SET UP R0.
```

```
5563 032674  010102                        MOV     R1,R2
5564 032676  062702  000014                ADD     #14,R2
5565 032702  010237  001236                MOV     R2,@#$TMP2      ;SAVE ADDRESS OF INSTRUCTION IN CASE
5566                                                                ;OF ERROR.
5567 032706  005037  177776                CLR     @#PSW           ;CLEAR THE PRIORITY TO ALLOW INTERRUPTS.
5568 032712  012777  032740  000220        MOV     #CORTV,@CORTRP  ;SET UP THE INTERRUPT VECTOR.
5569 032720  012767  177777  000176        MOV     #-1,CORFLG      ;SET THE FLAG TO INDICATE
5570                                                                ;AN INTERRUPT IS PENDING.
5571 032726  012777  177777  000202        MOV     #-1,@CORINT     ;ENABLE THE TEST EQUIPMENT'S
5572                                                                ;TRAP FUNCTION AND GO
5573 032734  000161  000014                JMP     14(R1)          ;EXECUTE THE INSTRUCTION.
5574
5575                              ;TRAP TO HERE WHEN THE INTERRUPT OCCURS.
5576 032740  005137  033124        CORTV:  COM     @#CORFLG        ;FIRST SEE IF AN INTERRUPT WAS PENDING.
5577 032744  001060                BNE     CORTV1          ;IF NOT GO REPORT AN ERROR.
5578 032746  012777  000000  000162        MOV     #0,@CORINT      ;MAKE SURE THE TEST EQUIPMENT
5579                                                                ;IS NOT INTERRUPT ENABLED.
5580
5581 032754  170204                        STFPS   R4              ;GET THE FPS.
5582 032756  012702  000200                MOV     #200,R2         ;GET AC0
5583 032762  170102                        LDFPS   R2
5584 032764  012702  033126                MOV     #CORTMP,R2
5585 032770  174012                        STD     AC0,(R2)
5586 032772  012737  033126  001240        MOV     #CORTMP,@#$TMP3
5587 033000  010037  001244                MOV     R0,@#$TMP5
5588 033004  010437  001250                MOV     R4,@#$TMP7
5589 033010  011637  001254                MOV     (SP),@#$TMP11
5590 033014  010102                        MOV     R1,R2
5591 033016  010237  001242                MOV     R2,@#$TMP4
5592 033022  062702  000010                ADD     #10,R2
5593 033026  012237  001246                MOV     (R2)+,@#$TMP6
5594 033032  012237  001252                MOV     (R2)+,@#$TMP10
5595 033036  010237  001256                MOV     R2,@#$TMP12
5596 033042  021602                        CMP     (SP),R2         ;SEE IF THE TRAP OCCURRED
5597                                                                ;AT THE CORRECT ADDRESS.
5598 033044  001016                        BNE     CORTV0
5599 033046  022626                        CMP     (SP)+,(SP)+     ;RESET THE STACK.
5600 033050  020061  000010                CMP     R0,10(R1)       ;SEE IF R0 IS CORRECT.
5601 033054  001012                        BNE     CORTV0          ;BR IF NOT CORRECT.
5602 033056  010102                        MOV     R1,R2           ;SEE IF AC0 WAS CORRECT
5603 033060  012703  033126                MOV     #CORTMP,R3
5604 033064  012705  000004                MOV     #4,R5
5605 033070  022223                1$:     CMP     (R2)+,(R3)+
5606 033072  001003                        BNE     CORTV0          ;BRANCH IF INCORRECT.
5607 033074  077503                        SOB     R5,1$
5608 033076  000161  000032                JMP     32(R1)          ;IF EVERYTHING IS CORRECT THEN RETURN.
5609
5610 033102  000161  000030        CORTV0: JMP     30(R1)          ;CORRECT FLOWS FAILED SO GO REPORT ERROR.
5611
5612 033106  011637  001236        CORTV1: MOV     (SP),@#$TMP2    ;AN INTERRUPT OCCURRED WHEN THE FLAG
5613                                                                ;CORFLG, DID NOT INDICATE THAT ONE WAS
5614                                                                ;PENDING SO REPORT SPURIOUS TRAP.
5615 033112  0C5037  033124                CLR     @#CORFLG
5616 033116  022626                        CMP     (SP)+,(SP)+
5617 033120  104266                        ERROR   +266
5618 033122  000407                        BR      CORDONE
5619
```

```
                                CORFLG: .WORD   0
                                CORTMP: .WORD   0,0,0,0
                                CORINT: .WORD   177774          ;THIS IS THE ADDRESS, 177774, OF THE
                                                                ;TEST EQUIPMENT'S STATUS REGISTER.
                                                                ;THE CONTENTS OF CORINT CAN BE MODIFIED
                                                                ;IF THIS STATUS REGISTER'S ADDRESS IS
                                                                ;CHANGED.
                                CORTRP: .WORD   110             ;THIS IS THE ADDRESS OF THE TEST EQUIPMENTS
                                                                ;TRAP VECTOR. LIKE THE STATUS REGISTER'S ADDRESS
                                                                ;DESCRIBED IMMEDIATELY ABOVE
                                                                ;THIS VECTOR CAN BE CHANGED, BUT THE
                                                                ;CONTENTS OF CORTRP MUST INDICATE THE
                                                                ;CHANGE.
                                CORDONE:
033142  104412                          RSETUP                ;GO INITIALIZE THE FPS AND STACK, AND
                                                              ;SEE IF THE USER HAS EXPRESSED
                                                              ;THE DESIRE TO CHANGE THE SOFTWARE
                                                              ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                              ;THE USER TYPED CONTROL G?).
                                TST23:


                                .SBTTL  END OF PASS ROUTINE
                                ;;**********************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                ;*IF SW12=1 INHIBIT TRACE TRAP
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO LOOP
033144                          $EOP:
033144  000004                         SCOPE
033146  005067  145730                 CLR     $TSTNM          ;;ZERO THE TEST NUMBER
033152  005067  146124                 CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
033156  005267  146142                 INC     $PASS           ;;INCREMENT THE PASS NUMBER
033162  042767  100000  146134         BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
033170  005327                         DEC     (PC)+           ;;LOOP?
033172  000001                 $EOPCT: .WORD   1
033174  003074                         BGT     $DOAGN          ;;YES
033176  012737                         MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
033200  000001                 $ENDCT: .WORD   1
033202  033172                         $EOPCT
033204  104401  033212                 TYPE    ,65$            ;;TYPE ASCIZ STRING
033210  000407                         BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <12><15>/END PASS #/
033230                          64$:
033230  016746  146070                 MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                               ;;TYPE PASS NUMBER IN OCTAL
033234  104403                         TYPOS                   ;;GO TYPE--OCTAL ASCII
033236     006                         .BYTE   6               ;;TYPE 6 DIGITS
033237     000                         .BYTE   0               ;;SUPPRESS LEADING ZEROS
```

```
033240  104401  033246                  TYPE    ,67$            ;;TYPE ASCIZ STRING
033244  000421                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
033310                          66$:
033310  016746  145576                  MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                ;;TOTAL NUMBER OF ERRORS IN OCTAL
033314  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
033316     006                          .BYTE   6               ;;TYPE 6 DIGITS
033317     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
033320  104401  001313                  TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN, LINE FEED
033324  005067  145562                  CLR     $ERTTL          ;;CLEAR ERROR TOTAL
033330  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
033334  001414                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
033336  005046                          CLR     -(SP)           ;;INSURE THE "T" BIT IS CLEAR
033340  012746  033346                  MOV     #$CLR.T,-(SP)   ;;SETUP FOR AN RTI OR RTT
033344  000426                          BR      $RTRN           ;;GO DO AN RTI OR RTT TO LOAD THE PSW
                                                                ;;WITH A CLEARED "T" BIT
033346                          $CLR.T:
033346  013700  000042                  MOV     @#42,R0         ;;INSURE R0 CONTAINS THE MONITORS
033352  001405                          BEQ     $DOAGN          ;;RETURN ADDRESS
033354  000005                          RESET                   ;;CLEAR THE WORLD
033356  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
033360  000240                          NOP                     ;;SAVE ROOM
033362  000240                          NOP                     ;;FOR
033364  000240                          NOP                     ;;ACT11
033366                          $DOAGN:
033366  104400                          TRAP                    ;;PUSH OLD PSW AND PC ON STACK
033370  042716  000020                  BIC     #20,(SP)        ;;CLEAR THE "T" BIT
033374  032777  010000  145536          BIT     #BIT12,@SWR     ;;RUN WITH TRACE TRAP?
033402  001005                          BNE     1$              ;;BR IF NO
033404  005167  000020                  COM     $TBIT           ;;IS IT TIME FOR TRACE TRAP
033410  100402                          BMI     1$              ;;BR IF NO
033412  052716  000020                  BIS     #20,(SP)        ;;SET TRACE TRAP
033416  012746  033424          1$:     MOV     #$LOOP,-(SP)    ;;JUMP TO START OF TEST
033422  000002                  $RTRN:  RTI                     ;;RETURN--THIS IS CHANGED TO
                                                                ;;AN "RTT" IF "RTT" IS A LEGAL
                                                                ;;INSTRUCTION
033424                          $LOOP:
033424  000137                          JMP     @(PC)+          ;;RETURN
033426  005020                  $RTNAD: .WORD   LOOP
033430  000000                  $TBIT:  .WORD   0               ;;"T" BIT STATE INDICATOR
033432     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                        .EVEN
5644
5645                            .SBTTL  SCOPE HANDLER ROUTINE
                                ;;**************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW11=1         INHIBIT ITERATIONS
                                ;*SW09=1         LOOP ON ERROR
                                ;*SW08-1         LOOP ON TEST IN SWR<7:0>
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE IOT
033436                          $SCOPE:
```

```
033436  104406                          CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
033440  032777  040000  145472  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
033446  001114                          BNE     $OVER           ;;YES IF SW14=1
                                ;######START OF CODE FOR THE XOR TESTER######
033450  000416                $XTSTR: BR      6$              ;;IF RUNNING ON THE 'XOR' TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A 'NOP' (NOP=240)
033452  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
033456  012737  033476  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
033464  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
033470  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
033474  000463                          BR      $SVLAD          ;;GO TO THE NEXT TEST
033476  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
033500  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
033504  000423                          BR      7$              ;;LOOP ON THE PRESENT TEST
033506                          6$:;######END OF CODE FOR THE XOR TESTER######
033506  032777  000400  145424          BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
033514  001404                          BEQ     2$              ;;BR IF NO
033516  127767  145416  145356          CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
033524  001465                          BEQ     $OVER           ;;BR IF YES
033526  105767  145351          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
033532  001421                          BEQ     3$              ;;BR IF NO
033534  126767  145355  145341          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
033542  101015                          BHI     3$              ;;BR IF NO
033544  032777  001000  145366          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
033552  001404                          BEQ     4$              ;;BR IF NO
033554  016767  145330  145324  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
033562  000446                          BR      $OVER
033564  105067  145313          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
033570  005067  145506                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
033574  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
033576  032777  004000  145334  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
033604  001011                          BNE     1$              ;;BR IF YES
033606  005767  145512                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
033612  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
033614  005267  145264                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
033620  026767  145456  145256          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
033626  002024                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
033630  012767  000001  145246  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
033636  016767  000052  145436          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
033644  105267  145232          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
033650  116767  145226  145444          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
033656  011667  145224                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
033662  011667  145222                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
033666  005067  145412                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
033672  112767  000001  145215          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
033700  016777  145176  145234  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
033706  016716  145174                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
033712  000002                          RTI                     ;;FIXES PS
033714  000001                  $MXCNT: 1                       ;;MAX. NUMBER OF ITERATIONS
5646
5647                                    .SBTTL  ERROR HANDLER ROUTINE
                                ;;******************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;*AND GO TO ERTYPE ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15-1         HALT ON ERROR
```

```
                                        ;*SW13=1        INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1        BELL ON ERROR
                                        ;*SW09=1        LOOP ON ERROR
                                        ;*CALL
                                        ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
033716                                  $ERROR:
033716  104406                                  CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR
033720  105267  145157                  7$:     INCB    $ERFLG                  ;;SET THE ERROR FLAG
033724  001775                                  BEQ     7$                      ;;DON'T LET THE FLAG GO TO ZERO
033726  016777  145150  145206                  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
033734  032777  002000  145176                  BIT     #BIT10,@SWR     ;;BELL ON ERROR?
033742  001402                                  BEQ     1$                      ;;NO - SKIP
033744  104401  001306                          TYPE    ,$BELL                  ;;RING BELL
033750  005267  145136                  1$:     INC     $ERTTL                  ;;COUNT THE NUMBER OF ERRORS
033754  011667  145136                          MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
033760  162767  000002  145130                  SUB     #2,$ERRPC
033766  117767  145124  145120                  MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
033774  032777  020000  145136                  BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
034002  001004                                  BNE     20$                     ;;SKIP TYPEOUTS
034004  004767  002174                          JSR     PC,ERTYPE       ;;GO TO USER ERROR ROUTINE
034010  104401  001313                          TYPE    ,$CRLF
034014                                  20$:
034014  122767  000001  145314                  CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
034022  001007                                  BNE     2$                      ;;NO,SKIP APT ERROR REPORT
034024  116767  145064  000004                  MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
034032  004767  001010                          JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
034036     000                  2*$:    .BYTE   0
034037     000                          .BYTE   0
034040  000777                  22$:    BR      22$                     ;;APT ERROR LOOP
034042  005777  145072          2$:     TST     @SWR                    ;;HALT ON ERROR
034046  100002                          BPL     3$                      ;;SKIP IF CONTINUE
034050  000000                          HALT                            ;;HALT ON ERROR!
034052  104406                          CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR
034054  032777  001000  145056  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
034062  001402                          BEQ     4$                      ;;BR IF NO
034064  016716  145020                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
034070  005767  145210          4$:     TST     $ESCAPE                 ;;CHECK FOR AN ESCAPE ADDRESS
034074  001402                          BEQ     5$                      ;;BR IF NONE
034076  016716  145202                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
034102                                  5$:
034102  022737  033356  000042                  CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
034110  001001                          BNE     6$                      ;;BRANCH IF NO
034112  000000                          HALT                            ;;YES
034114                                  6$:
034114  032777  001000  145016                  BIT     #BIT09,@SWR
034122  001013                          BNE     ERM10
034124  011637  001162                  MOV     (SP),@#$REG0                    ;SEE IF ERROR #377
034130  062737  177776  001162                  ADD     #-2,@#$REG0
034136  122777  000377  145016                  CMPB    #377,@$REG0
034144  001002                          BNE     ERM10
034146  062716  000002                  ADD     #2,(SP)
034152  000002                  ERM10:  RTI
5648
5649                                    .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
                                        ;;**************************************************************
                                        ;*SAVE R0-R5
                                        ;*CALL:
```

```
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;*  +2---(+18)
                                ;*  +4---R5
                                ;*  +6---R4
                                ;*  +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0
034154                          $SAVREG:
034154  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
034156  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
034160  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
034162  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
034164  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
034166  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
034170  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
034174  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
034200  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
034204  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
034210  000002                          RTI
                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RFSREG
034212                          $RESREG:
034212  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
034216  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
034222  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
034226  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
034232  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
034234  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
034236  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
034240  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
034242  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
034244  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
034246  000002                          RTI
5650
5651                            .SBTTL  TYPE ROUTINE
                                ;;******************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*
034250  105767  144703          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
034254  100002                          BPL     1$              ;;BR IF YES
034256  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
```

```
034260  000430                          BR      3$              ;;LEAVE
034262  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
034264  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
034270  122767  000001  145040          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
034276  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
034300  132767  000100  145031          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
034306  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
034310  010067  000004                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
034314  004767  000516                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
034320  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
034322  132767  000040  145007  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
034330  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
034332  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
034334  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
034336  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
034340  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
034342  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
034346  000002                          RTI                     ;;RETURN
034350  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
034354  001430                          BEQ     8$
034356  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
034362  001006                          BNE     5$
034364  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
034366  104401                          TYPE                    ;;TYPE A CR AND LF
034370  001313                          $CRLF
034372  105067  000200                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
034376  000755                          BR      2$              ;;GET NEXT CHARACTER
034400  004767  000056          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
034404  126726  144546          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
034410  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
034412  016746  144536                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
034416  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
034422  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
034424  004767  000032                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
034430  105367  000142                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
034434  000770                          BR      7$              ;;LOOP
                        ;HORIZONTAL TAB PROCESSOR
034436  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
034442  004767  000014          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
034446  132767  000007  000122          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
034454  001372                          BNE     9$              ;;TAB STOP
034456  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
034460  000724                          BR      2$              ;;GET NEXT CHARACTER
034462  105777  144462          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
034466  100375                          BPL     $TYPEC
034470  116677  000002  144454          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
034476  105777  144442                  TSTB    @$TKS           ;;SEE IF KEYBOARD IS TALKING.
034502  100021                          BPL     2$              ;;BRANCH IF IT ISN'T.
034504  017746  144436                  MOV     @$TKB,-(SP)     ;;PUSH CHARACTER ONTO STACK.
034510  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
034514  022726  000023                  CMP     #23,(SP)+       ;;SEE IF THIS IS A ^S.
034520  001012                          BNE     2$              ;;BRANCH TO CONTINUE IF IT ISN'T.
034522  105777  144416          3$:     TSTB    @$TKS           ;;WAIT FOR ANOTHER INPUT.
034526  100375                          BPL     3$              ;;BRANCH BACK IF NOT READY.
034530  017746  144412                  MOV     @$TKB,-(SP)     ;;PUSH NEXT CHARACTER ON STACK.
034534  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
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034540  022726  000002                      CMP     #21,(SP)+       ;;SEE IF THIS IS A ^Q.
034544  001366                              BNE     3$              ;;BRANCH BACK FOR MORE WAIT IF NOT.
034546  122766  000015  000002  2$:         CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
034554  001003                              BNE     1$              ;;BRANCH IF NO
034556  105067  000014                      CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
034562  000406                              BR      $TYPEX          ;;EXIT
034564  122766  000012  000002  1$:         CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
034572  001402                              BEQ     $TYPEX          ;;BRANCH IF YES
034574  105227                              INCB    (PC)+           ;;COUNT THE CHARACTER
034576  000000                  $CHARCNT:.WORD  0                   ;;CHARACTER COUNT STORAGE
034600  000207                  $TYPEX: RTS     PC
5652
5653                            .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
                                ;;******************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT
034602  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
034606  116667  000001  000211          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
034614  112667  000207                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
034620  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
034624  000406                          BR      $TYPON
034626  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
034634  112767  000006  000165          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
034642  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
034650  010346                          MOV     R3,-(SP)        ;;SAVE R3
034652  010446                          MOV     R4,-(SP)        ;;SAVE R4
034654  010546                          MOV     R5,-(SP)        ;;SAVE R5
034656  116704  000145                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
034662  005404                          NEG     R4
034664  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
034670  110467  000132                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
034674  116704  000125                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
034700  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
034704  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
034706  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
034710  000404                          BR      3$              ;;GO DO MSB
034712  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
034714  006105                          ROL     R5
```

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035716  006105                          ROL     R5
035720  010503                          MOV     R5,R3
035722  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
035724  105367  000076                  DECB    $OMODE          ;;TYPE THIS DIGIT?
035730  100016                          BPL     7$              ;;BR IF NO
035732  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
035736  001002                          BNE     4$              ;;TEST FOR 0
035740  005704                          TST     R4              ;;SUPPRESS THIS 0?
035742  001403                          BEQ     5$              ;;BR IF YES
035744  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
035746  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
035752  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
035756  110367  000040                  MOVB    R3,8$           ;;SAVE FOR TYPING
035762  104401  035022                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
035766  105367  000032          7$:     DECB    $OCNT           ;;COUNT BY 1
035772  003347                          BGT     2$              ;;BR IF MORE TO DO
035774  002402                          BLT     6$              ;;BR IF DONE
035776  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
035000  000744                          BR      2$              ;;GO DO THE LAST DIGIT
035002  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
035004  012604                          MOV     (SP)+,R4        ;;RESTORE R4
035006  012603                          MOV     (SP)+,R3        ;;RESTORE R3
035010  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
035016  012616                          MOV     (SP)+,(SP)
035020  000002                          RTI                     ;;RETURN
035022     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
035023     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
035024     000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
035025     000          $OFILL. .BYTE   0               ;;ZERO FILL SWITCH
035026  000000          $UMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
5654
5655                            .SBTTL  APT COMMUNICATIONS ROUTINE
                                ;;*****************************************************************
035030  112767  000001  000236  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
035036  112767  000001  000226  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
035044  000403                          BR      $ATYC
035046  112767  000001  000220  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
035054                          $ATYC:
035054  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
035056  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
035060  105767  000206                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
035064  001450                          BEQ     5$              ;;IF NOT:  BR
035066  122767  000001  144242          CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
035074  001031                          BNE     3$              ;;IF NOT:  BR
035076  132767  000100  144233          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
035104  001425                          BEQ     3$              ;;IF NOT:  BR
035106  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
035112  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
035120  005767  144172          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
035124  001375                          BNE     1$              ;;IF NOT:  WAIT
035126  010067  144200                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
035132  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
035134  001376                          BNE     2$
035136  166700  144170                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
035142  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
035144  010067  144164                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
035150  012767  000004  144140          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
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035156  000413                          BR      5$
035160  017667  000004  000016  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
035166  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
035174  016746  142576                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
035200  004767  177044                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
035204  000000                  4$:     .WORD   0
035206                          5$:
035206  105767  000062          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
035212  001416                          BEQ     12$             ;;IF NOT:  BR
035214  005767  144116                  TST     $ENV            ;;RUNNING UNDER APT?
035220  001413                          BEQ     12$             ;;IF NOT:  BR
035222  005767  144070          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
035226  001375                          BNE     11$             ;;IF NOT:  WAIT
035230  017667  000004  144062          MOV     @4(SP),$FATAL   ;;GET ERROR #
035236  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
035244  005267  144046                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
035250  105067  000020          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
035254  105067  000013                  CLRB    $LFLG           ;;CLEAR LOG FLAG
035260  105067  000006                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
035264  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
035266  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
035270  000207                          RTS     PC              ;;RETURN
035272     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
035273     000          $LFLG:  .BYTE   0               ;;LOG FLAG
035274     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
            000200          APTSIZE=200
            000001          APTENV=001
            000100          APTSPOOL=100
            000040          APTCSUP=040
5656
5657                        .SBTTL  TTY INPUT ROUTINE
                            ;;*********************************************************************
                            .ENABL  LSB
                            ;;*********************************************************************
                            ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                            ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                            ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                            ;*WHEN OPERATING IN TTY FLAG MODE.
035276  022767  000176  143634  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
035304  001074                          BNE     15$             ;;BRANCH IF NO
035306  105777  143632                  TSTB    @$TKS           ;;CHAR THERE?
035312  100071                          BPL     15$             ;;IF NO, DON'T WAIT AROUND
035314  117746  143626                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
035320  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
035324  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
035330  001062                          BNE     15$             ;;NO, RETURN TO USER
035332  126727  143576  000001          CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
035340  001456                          BEQ     15$             ;;BRANCH IF YES
035342  104401  035705                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
035346  104401  035712          $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
035352  016746  142620                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
035356  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035360  104401  035723                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
035364  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
035366  005046                          CLR     -(SP)           ;;THE NEW SWR
035370  105777  143550          7$:     TSTB    @$TKS           ;;CHAR THERE?
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035374  100375                          BPL     7$              ;;IF NOT TRY AGAIN
035376  117746  143544                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
035402  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
035406  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
035412  001005                          BNE     10$             ;;BRANCH IF NOT
035414  104401  035700                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
035420  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
035424  000757                          BR      19$             ;;LET'S TRY IT AGAIN
035426  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
035432  001022                          BNE     16$             ;;BRANCH IF NO
035434  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
035440  001403                          BEQ     11$             ;;BRANCH IF YES
035442  016677  000002  143470          MOV     2(SP),@SWR      ;;SAVE NEW SWR
035450  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
035454  104401  001313          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
035460  126727  143451  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
035466  001003                          BNE     15$             ;;BRANCH IF NOT
035470  012777  000100  143446          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
035476  000002          15$:    RTI                             ;;RETURN
035500  004767  176756          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
035504  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
035510  002420                          BLT     18$             ;;BRANCH IF YES
035512  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
035516  003015                          BGT     18$             ;;BRANCH IF YES
035520  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
035524  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
035530  001403                          BEQ     17$             ;;BRANCH IF YES
035532  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
035534  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
035536  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE.
035540  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
035544  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
035550  000707                          BR      7$              ;;GET THE NEXT ONE
035552  104401  001312          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
035556  000720                          BR      20$             ;;SIMULATE CONTROL-U
                        .DSABL  LSB
                        ;;*****************************************************************
                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*CALL:
                        ;*      RDCHR                           ;;INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*      RETURN HERE                     ;;CHARACTER IS ON THE STACK
                        ;*                                      ;;WITH PARITY BIT STRIPPED OFF
                        ;
035560  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
035562  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
035570  105777  143350          1$:     TSTB    @$TKS           ;;WAIT FOR
035574  100375                          BPL     1$              ;;A CHARACTER
035576  117766  143344  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
035604  042766  177600  000004          BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
035612  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
035620  001013                          BNE     3$              ;;BRANCH IF NO
035622  105777  143316          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
035626  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
035630  117746  143312                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
035634  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
035640  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
035644  001366                          BNE     2$              ;;IF NOT DISCARD IT
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035646  000750                          BR      1$                      ;;YES, RESUME
035650  026627  000004  000140  3$:     CMP     4(SP),#140              ;;IS IT UPPER CASE?
035656  002407                          BLT     4$                      ;;BRANCH IF YES
035660  026627  000004  000175          CMP     4(SP),#175              ;;IS IT A SPECIAL CHAR?
035666  003003                          BGT     4$                      ;;BRANCH IF YES
035670  042766  000040  000004          BIC     #40,4(SP)               ;;MAKE IT UPPER CASE
035676  000002                  4$:     RTI                             ;;GO BACK TO USER
035700     136     125     015  $CNTLU: .ASCIZ   /^U/<15><12>           ;;CONTROL 'U'
035703     012     000
035705     136     107     015  $CNTLG: .ASCIZ   /^G/<15><12>           ;;CONTROL ''G''
035710     012     000
035712     015     012     123  $MSWR:  .ASCIZ   <15><12>/SWR = /
035715     127     122     040
035720     075     040     000
035723     040     040     116  $MNEW:  .ASCIZ   /  NEW = /
035726     105     127     040
035731     075     040     000
5658
5659                                    .SBTTL  TRAP DECODER
                                        ;;******************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE ''TRAP'' INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.
035734  010046                  $TRAP:  MOV     R0,-(SP)                ;;SAVE R0
035736  016600  000002                  MOV     2(SP),R0                ;;GET TRAP ADDRESS
035742  005740                          TST     -(R0)                   ;;BACKUP BY 2
035744  111000                          MOVB    (R0),R0                 ;;GET RIGHT BYTE OF TRAP
035746  006300                          ASL     R0                      ;;POSITION FOR INDEXING
035750  016000  035770                  MOV     $TRPAD(R0),R0           ;;INDEX TO TABLE
035754  000200                          RTS     R0                      ;;GO TO ROUTINE
                                        ;;THIS IS USE TO HANDLE THE ''GETPRI'' MACRO
035756  011646                  $TRAP2: MOV     (SP),-(SP)              ;;MOVE THE PC DOWN
035760  016666  000004  000002          MOV     4(SP),2(SP)             ;;MOVE THE PSW DOWN
035766  000002                          RTI                             ;;RESTORE THE PSW
                                        .SBTTL  TRAP TABLE
                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE ''TRAP'' INSTRUCTION.
                                        ;       ROUTINE
                                        ;       -------
035770  035756                  $TRPAD: .WORD   $TRAP2
035772  034250                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
035774  034626                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
035776  034602                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
036000  034642                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
036002  035346                          $GTSWR  ;;CALL=GTSWR    TRAP+5(104405)  GET SOFT-SWR SETTING
036004  035276                          $CKSWR  ;;CALL=CKSWR    TRAP+6(104406)  TEST FOR CHANGE IN SOFT-SWR
036006  035560                          $RDCHR  ;;CALL=RDCHR    TRAP+7(104407)  TTY TYPEIN CHARACTER ROUTINE
036010  034154                          $SAVREG ;;CALL=SAVREG   TRAP+10(104410) SAVE R0-R5 ROUTINE
036012  034212                          $RESREG ;;CALL=RESREG   TRAP+11(104411) RESTORE R0-R5 ROUTINE
5660 036014  036754                     .RSET   ;;CALL=RSETUP   TRAP+12(104412) ROUTINE TO INITIALIZE AFTER EVERY TEST
5661 036016  036746                     .LPER   ;;CALL=LPERR    TRAP+13(104413) ROUTINE TO SET LOOP ON ERROR ADDRESS
5662         000030                 $TERM .-$TRPAD
5663
5664                                    .SBTTL  POWER DOWN AND UP ROUTINES
                                        ;;******************************************************************
                                        ;POWER DOWN ROUTINE
```

```
036020  012737  036176  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
036026  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
036034  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036036  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036040  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
036042  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
036044  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
036046  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
036050  017746  143064                  MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
036054  010667  000122                  MOV     SP,$SAVR6       ;;SAVE SP
036060  012737  036072  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
036066  000000                          HALT
036070  000776                          BR      .-2             ;;HANG UP
                        ;;**************************************************************
                        ;POWER UP ROUTINE
036072  012737  036176  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
036100  016706  000076                  MOV     $SAVR6,SP       ;;GET SP
036104  005067  000072                  CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
036110  005267  000066          1$:     INC     $SAVR6          ;;WAIT FOR THE INC
036114  001375                          BNE     1$              ;;OF  WORD
036116  012677  143016                  MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
036122  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
036124  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
036126  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
036130  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
036132  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
036134  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
036136  012737  036020  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
036144  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
036152  104401                          TYPE                    ;;REPORT THE POWER FAILURE
036154  037150          $PWRMG: .WORD   POWERM                  ;;POWER FAIL MESSAGE POINTER
036156  012716                          MOV     (PC)+,(SP)      ;;RESTART AT START
036160  004336          $PWRAD: .WORD   START                   ;;RESTART ADDRESS
036162  042766  000020  000002          BIC     #20,2(SP)       ;;CLEAR 'T' BIT
036170  005067  175234                  CLR     $TBIT           ;;CLEAR THE 'T' BIT FLAG
036174  000002                          RTI
036176  000000          $ILLUP: HALT                            ;;THE POWER UP SEQUENCE WAS STARTED
036200  000776                          BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
036202  000000          $SAVR6: 0                               ;;PUT THE SP HERE
5665
5666
5667                            .SBTTL  ERROR TYPE OUT ROUTINE
5668                    ;;**************************************************************
                        ;;**************************************************************
5669                    ;*THIS ROUTINE IS CALLED TO TYPE AN ERROR MESSAGE WHICH IS INCLUDED
5670                    ;*IN THE ERROR MESSAGE DATA TABLE. IT IS CALLED BY THE $ERROR ROUTINE
5671                    ;*OR BY FIRST SETTING $ITEMB EQUAL TO THE ERROR TABLE ITEM TO BE PRINTED
5672                    ;*OUT AND THEN ECECUTING A:
5673                    ;*              JSR     PC,ERTYPE
5674                    ;*
5675 036204  104401    ERTYPE: TYPE                                    ;TYPE A CRLF
5676 036206  001313            .WORD   $CRLF
5677 036210  113737  001102  001232    MOVB    @#$TSTNM,@#$TMP0
5678 036216  042737  177400  001232    BIC     #177400,@#$TMP0
5679 036224  013737  001116  001234    MOV     @#$ERRPC,@#$TMP1        ;GET PC OF CALL
5680 036232  010046                    MOV     R0,-(SP)                ;SAVE R0
5681
```

```
 5682 036234  113700  001114            MOVB    @#$ITEMB,R0          ;GET THE ITEM NUMBER.
 5683 036240  042700  177400            BIC     #177400,R0
 5684 036244  001005                    BNE     1$
 5685
 5686 036246  013746  001116            MOV     @#$ERRPC,-(SP)       ;IF ZERO THEN JUST
 5687 036252  104402                    TYPOC                        ;PRINT THE PC
 5688 036254  000137  036654            JMP     @#ERT5
 5689
 5690 036260  022700  000377      1$:   CMP     #377,R0
 5691 036264  001005                    BNE     20$
 5692 036266  016600  000004            MOV     4(SP),R0
 5693 036272  011000                    MOV     (R0),R0
 5694 036274  062700  000400            ADD     #400,R0
 5695 036300  005300            20$:    DEC     R0                   ;OTHERWISE MAKE R0 AN
 5696 036302  006300                    ASL     R0                   ;INDEX FOR THE TABLE.
 5697 036304  006300                    ASL     R0
 5698 036306  006300                    ASL     R0
 5699 036310  062700  001442            ADD     #$ERRTB,R0
 5700
 5701 036314  012037  036324            MOV     (R0)+,@#2$           ;PICK UP THE ADDRESS
 5702 036320  001404                    BEQ     3$                   ;OF THE EM, ERROR MESSAGE
 5703 036322  104401                    TYPE
 5704 036324  000000            2$:     .WORD   0
 5705 036326  104401                    TYPE
 5706 036330  001313                    .WORD   $CRLF
 5707
 5708 036332  012037  036342      3$:   MOV     (R0)+,@#4$           ;GET THE DH,DATA HEADER
 5709 036336  001404                    BEQ     5$
 5710 036340  104401                    TYPE
 5711 036342  000000            4$:     .WORD   0
 5712 036344  104401                    TYPE
 5713 036346  001313                    .WORD   $CRLF
 5714
 5715 036350  010146            5$:     MOV     R1,-(SP)             ;SAVE R1,R2 AND R3
 5716 036352  010246                    MOV     R2,-(SP)
 5717 036354  010346                    MOV     R3,-(SP)
 5718
 5719 036356  012001                    MOV     (R0)+,R1             ;GET THE ADDRESS OF THE
 5720                                                                ;DATA TABLE.
 5721 036360  001002                    BNE     6$
 5722 036362  000137  036642            JMP     @#ERT4               ;RETURN IF NO DATA.
 5723
 5724 036366  011000            6$:     MOV     (R0),R0              ;GET A POINTER TO THE DATA
 5725                                                                ;FORMAT TABLE.
 5726 036370  105710            ERT1:   TSTB    (R0)                 ;FORMAT ZERO?
 5727 036372  001004                    BNE     7$
 5728
 5729 036374  013146                    MOV     @(R1)+,-(SP)         ;FORMAT ZERO SO TYPE
 5730 036376  104402                    TYPOC                        ;AN OCTAL NUMBER.
 5731 036400  000137  036624            JMP     @#ERT2
 5732
 5733 036404                    7$:
 5734 036404  122710  000002      8$:   CMPB    #2,(R0)              ;FORMAT TWO?
 5735 036410  001011                    BNE     9$
 5736
 5737 036412  013102                    MOV     @(R1)+,R2            ;FORMAT TWO SO TYPE TWO
 5738 036414  012246                    MOV     (R2)+,-(SP)          ;OCTAL NUMBERS.
```

```
 5739 036416  104402                        TYPOC
 5740 036420  104401                        TYPE
 5741 036422  037217                        .WORD   SPACE
 5742 036424  011246                        MOV     (R2),-(SP)
 5743 036426  104402                        TYPOC
 5744 036430  000137  036624                JMP     @#ERT2
 5745
 5746 036434  122710  000003          9$:   CMPB    #3,(R0)                 ;FORMAT THREE?
 5747 036440  001021                        BNE     10$
 5748
 5749 036442  013102                        MOV     @(R1)+,R2               ;FORMAT THREE SO TYPE
 5750 036444  012246                        MOV     (R2)+,-(SP)             ;FOUR OCTAL NUMBERS.
 5751 036446  104402                        TYPOC
 5752 036450  104401                        TYPE
 5753 036452  037217                        .WORD   SPACE
 5754 036454  012246                        MOV     (R2)+,-(SP)
 5755 036456  104402                        TYPOC
 5756 036460  104401                        TYPE
 5757 036462  037217                        .WORD   SPACE
 5758 036464  012246                        MOV     (R2)+,-(SP)
 5759 036466  104402                        TYPOC
 5760 036470  104401                        TYPE
 5761 036472  037217                        .WORD   SPACE
 5762 036474  011246                        MOV     (R2),-(SP)
 5763 036476  104402                        TYPOC
 5764 036500  000137  036624                JMP     @#ERT2
 5765
 5766 036504  122710  000004          10$:  CMPB    #4,(R0)                 ;FORMAT FOUR?
 5767 036510  001005                        BNE     11$
 5768
 5769 036512  013146                        MOV     @(R1)+,-(SP)            ;FORMAR FOUR SO TYPE
 5770 036514  104403                        TYPOS                           ;AN OCTAL NUMBER
 5771 036516     016                        .BYTE   16                      ;SUPPRESSING LEADING ZEROES.
 5772 036517     000                        .BYTE   0
 5773 036520  000137  036624                JMP     @#ERT2
 5774
 5775 036524  122710  000005          11$:  CMPB    #5,(R0)                 ;FORMAT FIVE?
 5776 036530  001006                        BNE     13$
 5777
 5778 036532  012137  036540                MOV     (R1)+,@#12$             ;FORMAT FIVE SO TYPE AN
 5779 036536  104401                        TYPE                            ;ASCIZ STRING.
 5780 036540  000000          12$:  .WORD   0
 5781 036542  000137  036630                JMP     @#ERT3
 5782
 5783 036546  122710  000011          13$:  CMPB    #11,(R0)                ;FORMAT ELEVEN?
 5784 036552  001006                        BNE     15$
 5785
 5786 036554  013137  036562                MOV     @(R1)+,@#14$            ;FORMAT ELEVEN SO PICK
 5787 036560  104401                        TYPE                            ;A POINTER TO AN ASCIZ
 5788 036562  000000          14$:  .WORD   0                               ;STRING.
 5789 036564  000137  036630                JMP     @#ERT3
 5790
 5791 036570  122710  000012          15$:  CMPB    #12,(R0)                ;FORMAT TWELVE?
 5792 036574  001012                        BNE     17$
 5793
 5794 036576  013102                        MOV     @(R1)+,R2               ;FORMAT TWELVE SO TYPE
 5795 036600  012703  000006                MOV     #6,R3                   ;TYPE SIX OCTAL NUMBERS
```

```
 5796 036604  012246                16$:   MOV     (R2)+,-(SP)
 5797 036606  104402                       TYPOC
 5798 036610  104401                       TYPE
 5799 036612  037217                       .WORD   SPACE
 5800 036614  077305                       SOB     R3,16$
 5801 036616  000137  036624               JMP     @#ERT2
 5802
 5803 036622  000000                17$:   HALT                    ;UNDEFINED FORMAT FOR DATA?????
 5804
 5805 036624  104401                ERT2:  TYPE                    ;PRINT A TAB AFTER TYPING
 5806 036626  037215                       .WORD   $TAB            ;AN DATA TABLE ENTRY
 5807                                                              ;OF ALL FORMATS EXCEPT
 5808                                                              ;ASCIZ, FORMATS 5 OR 11
 5809
 5810 036630  005200                ERT3:  INC     R0              ;POINT TO THE NEXT FORMAT
 5811 036632  005711                       TST     (R1)            ;END OF DATA TABLE.
 5812 036634  001402                       BEQ     ERT4
 5813 036636  000137  036370               JMP     @#ERT1
 5814
 5815 036642  104401                ERT4:  TYPE                    ;DONE.
 5816 036644  001313                       .WORD   $CRLF
 5817 036646  012603                       MOV     (SP)+,R3        ;RESTORE R1,R2 AND R3
 5818 036650  012602                       MOV     (SP)+,R2
 5819 036652  012601                       MOV     (SP)+,R1
 5820 036654  012600                ERT5:  MOV     (SP)+,R0        ;RESTORE R0.
 5821 036656  000207                       RTS     PC              ;AND RETURN.
 5822
 5823
 5824
 5825
 5826                                      .SBTTL  FPP SPURIOUS TRAP TO 244 HANDLER
 5827                                ;;**********************************************************************
                                    ;;**********************************************************************
 5828                                ;*THIS ROUTINE HANDLES UNEXPECTED TRAPS TO THE FPP TRAP VECTOR AT 244.
 5829                                ;*THE LAST FPP INSTRUCTION EXECUTED AND ITS ADDRESS HAS BEEN RECORDED
 5830                                ;*THESE ALONG WITH THE FEC, FPS AND PC OF TRAP ARE REPORTED.
 5831                                ;*
 5832 036660  011637  001236  FPSPUR: MOV     (SP),@#$TMP2            ;SAVE PC OF TRAP.
 5833 036664  022626                       CMP     (SP)+,(SP)+         ;RESTORE SP.
 5834 036666  170200                       STFPS   R0                  ;GET FPS
 5835 036670  010037  001240               MOV     R0,@#$TMP3
 5836 036674  170300                       STST    R0                  ;GET FEC
 5837 036676  010037  001242               MOV     R0,@#$TMP4
 5838 036702  104247                1$:    ERROR   +247
 5839 036704  104412                       RSETUP                  ;GO INITIALIZE THE FPS AND STACK; AND
                                                                    ;SEE IF THE USER HAS EXPRESSED
                                                                    ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                    ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                    ;THE USER TYPED CONTROL G?).
 5840 036706  000137  033144               JMP     @#$EOP
 5841
 5842
 5843                                      .SBTTL  CPU SPURIOUS TRAP TO 4 HANDLER
 5844                                ;;**********************************************************************
                                    ;;**********************************************************************
 5845                                ;*THIS ROUTINE REPORTS UNEXPECTED CPU TRAPS TO VECTOR 4.
 5846                                ;*
```

```
5847 036712  011637  001236          CPSPUR: MOV     (SP),@#$TMP2            ;SAVE PC OF TRAP.
5848 036716  022626                          CMP     (SP)+,(SP)+
5849 036720  104250                  1$:     ERROR   +250
5850 036722  104412                          RSETUP                          ;GO INITIALIZE THE FPS AND STACK; AND
                                                                             ;SEE IF THE USER HAS EXPRESSED
                                                                             ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                             ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                             ;THE USER TYPED CONTROL G?).
5851 036724  000137  033144                  JMP     @#$EOP
5852
5853
5854                                          .SBTTL  CPU SPURIOUS TRAP TO 10 HANDLER
5855                                  ;;**************************************************************
                                      ;;**************************************************************
5856                                  ;*THIS ROUTINE REPORTS UNEXPECTED CPU TRAPS TO VECTOR 10.
5857                                  ;*
5858 036730  011637  001236          CPTWO:  MOV     (SP),@#$TMP2            ;SAVE PC OF TRAP.
5859 036734  022626                          CMP     (SP)+,(SP)+
5860 036736  104251                  1$:     ERROR   +251
5861 036740  104412                          RSETUP                          ;GO INITIALIZE THE FPS AND STACK; AND
                                                                             ;SEE IF THE USER HAS EXPRESSED
                                                                             ;THE DESIRE TO CHANGE THE SOFTWARE
                                                                             ;VIRTUAL CONSOLE SWITCH REGISTER (HAS
                                                                             ;THE USER TYPED CONTROL G?).
5862 036742  000137  033144                  JMP     @#$EOP
5863
5864
5865
5866
5867
5868                                          .SBTTL  SET LOOP ON ERROR ADDRESS ROUTINE
5869                                  ;;**************************************************************
                                      ;;**************************************************************
5870                                  ;*
5871 036746  011637  001110          .LPER:  MOV     (SP),@#$LPERR
5872 036752  000002                          RTI
5873
5874                                          .SBTTL  FLAG RESET AND CONSOLE TEST ROUTINE
5875                                  ;;**************************************************************
                                      ;;**************************************************************
5876                                  ;*THIS ROUTINE WILL BE CALLED AT THE END OF EACH TEST TO
5877                                  ;*RESET THE STACK, CLEAR THE FPS AND SEE IF THE USER HAS TYPED
5878                                  ;* CONTROL G ON THE TERMINAL. IF THE USER HAS TYPED CONTROL G AND
5879                                  ;*THERE IS NO PHYSICAL CONSOLE SWITCH REGISTER THEN THE CONTENTS
5880                                  ;*OF THE SOFTWARE SWITCH REGISTER WILL BE TYPED IN OCTAL ON THE
5881                                  ;*TELETYPE AND THE USER CAN MODIFY IT.
5882                                  ;*
5883 036754  023727  001140  177570  .RSET:  CMP     @#SWR,#177570           ;SEE IF THERE IS A PHYSICAL
5884                                                                         ;CONSOLE SWITCH REGISTER.
5885 036762  001001                          BNE     1$                      ;BRANCH IF NO.
5886 036764  104406                          CKSWR                           ;OTHERWISE TYPE THE CONTENTS
5887                                                                         ;OF THE PROGRAM VIRTUAL SWITCH REGISTER
5888                                                                         ;AND GIVE THE USER A CHANCE TO
5889                                                                         ;MODIFY IT.
5890 036766  012737  036660  000244  1$:     MOV     #FPSPUR,@#FPVECT
5891 036774  012737  036712  000004          MOV     #CPSPUR,@#ERRVECT
5892 037002  012737  036730  000010          MOV     #CPTWO,@#10
```

```
5893 037010  011600                    MOV     (SP),R0                 ;SAVE RETURN ADDRESS.
5894 037012  012706  001100              MOV     #STACK,SP               ;RESET THE STACK POINTER.
5895 037016  005004                    CLR     R4                      ;CLEAR THE FPS.
5896 037020  170104                    LDFPS   R4
5897 037022  000110                    JMP     (R0)                    ;RETURN.
5898
5899
5900                                   .NLIST  BEX
5901
5902                             ;THESE ARE SPECIAL MESSAGES:
5903
5904 037024      124     122     101  MSA1:   .ASCIZ  'TRAPPED AT:'<TAB><TAB>
5905 037042      105     130     120  MSA2:   .ASCIZ  'EXPECTED TRAP AT:'<TAB>
5906 037065      107     117     124  MSA3:   .ASCIZ  'GOT R0:'<TAB><TAB>
```

```
 5908 037077  105  130  120  MSA4:   .ASCIZ  'EXPECTED R0:'<TAB>
 5909 037115  107  117  124  MSA5:   .ASCIZ  'GOT AC0:'<TAB><TAB>
 5910 037130  105  130  120  MSA6:   .ASCIZ  'EXPECTED AC0:'<TAB><TAB>
 5911
 5912
 5913 037150  200  120  117  POWERM: .ASCIZ  <CRLF>'POWER FAILURE. PROGRAM RESTARTING.'<CRLF>
 5914 037215  011  000       $TAB:   .ASCIZ  <TAB>
 5915 037217  040  040  000  SPACE:  .ASCIZ  '  '
 5916 037222  101  103  040  MS1:    .ASCIZ  'AC OPERAND:'<TAB><TAB>
 5917 037240  106  123  122  MS2:    .ASCIZ  'FSRC OPERAND:'<TAB><TAB>
 5918 037260  101  103  060  MS3:    .ASCIZ  'AC0 BEFORE EXECUTION:'<TAB>
 5919 037307  101  103  060  MS4:    .ASCIZ  'AC0 AFTER EXECUTION:'<TAB>
 5920 037335  105  130  120  MS5:    .ASCIZ  'EXPECTED RESULT:'<TAB>
 5921 037357  107  117  124  MS6:    .ASCIZ  'GOT RESULT:'<TAB><TAB>
 5922 037375  106  122  101  MS7:    .ASCIZ  'FRACTIONAL RESULT:'<TAB>
 5923 037421  111  116  124  MS10:   .ASCIZ  'INTEGER RESULT: '<TAB>
 5924 037443  105  130  120  MS11:   .ASCIZ  'EXPECTED FRACTION:'<TAB>
 5925 037467  105  130  120  MS12:   .ASCIZ  'EXPECTED INTEGER:'<TAB>
 5926 037512  114  117  101  MS37:   .ASCIZ  'LOADED DATA: '
 5927 037530  122  105  101  MS40:   .ASCIZ  'READ DATA: '
 5928 037544  105  130  120  MS415:  .ASCIZ  'EXPECTED DATA: '
 5929 037564  104  101  124  MS41:   .ASCIZ  'DATA IN (R0) FSRC: '
 5930 037610  104  101  124  MS42:   .ASCIZ  'DATA IN AC0: '
 5931 037626  107  117  124  MS43:   .ASCIZ  'GOT RESULT: '
 5932 037643  105  130  120  MS44:   .ASCIZ  'EXPECTED RESULT: '
 5933 037665  200  124  105  CORMES: .ASCIZ  <CRLF>'TEST 22, TESTING INTERRUPTS.'<CRLF>
 5934
 5935
 5936                         ;THESE ARE ERROR MESSAGES:
 5937 037724  106  120  123  EM1:    .ASCIZ  'FPS BAD AFTER CMPD (R),A.'
 5938 037756  101  103  060  EM2:    .ASCIZ  'AC0 MODIFIED BY CMPD (R),A.'
 5942 040012                  EM3:
      040012  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5943 040036  050  102  125          .ASCIZ  '(BUT ENBT) STATE 225 WENT TO 475 INSTEAD OF 075.'
 5944 040117                  EM4:
      040117  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5945 040143  050  102  125          .ASCIZ  '(BUT ENBT) STATE 225 WENT TO 075 INSTEAD OF 475.'
 5946 040224                  EM5:
      040224  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5947 040250  050  102  125          .ASCIZ  '(BUT ENBT) STATE 035 WENT TO 075 INSTEAD OF 475.'
 5948 040331                  EM6:
      040331  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5949 040355  050  102  125          .ASCIZ  '(BUT ENBT) STATE 035 WENT TO 475 INSTEAD OF 075.'
 5950 040436                  EM7:
      040436  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5951 040462  050  102  125          .ASCIZ  '(BUT ENBT Y8) STATE 777 SHOULD HAVE GONE TO 007.'
 5952 040543                  EM10:
      040543  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5953 040567  050  102  125          .ASCIZ  '(BUT ENBT Y8) STATE 777 SHOULD HAVE GONE TO 405.'
 5954 040650                  EM11:
      040650  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5955 040674  050  102  125          .ASCIZ  '(BUT NBIT ZBIT) STATE 456 SHOULD HAVE GONE TO 010.'
 5956 040757                  EM12:
      040757  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5957 041003  050  102  125          .ASCIZ  '(BUT NBIT ZBIT) STATE 456 SHOULD HAVE GONE TO 110.'
 5958 041066                  EM13:
      041066  106  120  123          .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
```

```
 5959 041112      104     111     104            .ASCIZ  /DIDN'T TAKE THE PATH: STATE 456, TO 012, TO 363 TO 120./
 5960 041202                             EM14:
      041202      106     120     123            .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5961 041226      050     102     125            .ASCIZ  '(BUT XNBT XZBT) STATE 363 WENT TO 140 INSTEAD OF 100.'
 5962 041314                             EM15:
      041314      106     120     123            .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5963 041340      050     102     125            .ASCIZ  '(BUT XNBT XZBT) STATE 363 WENT TO 100 INSTEAD OF 140.'
 5964 041426                             EM16:
      041426      106     120     123            .ASCII  'FPS BAD AFTER CMPD.'<CRLF>
 5965 041452      104     111     104            .ASCIZ  /DIDN'T TAKE THE PATH: STATE 777, TO 407./
 5966 041523      104     111     126    EM17:   .ASCIZ  'DIVD (R),A TRAPPED TO 244. FSRC=0 AND FID=1.'
 5967 041600      106     120     123    EM20:   .ASCIZ  'FPS BAD AFTER DIVD (R),A.'
 5968 041632      106     105     103    EM21:   .ASCIZ  'FEC BAD AFTER DIVD (R),A.'
 5969 041664      104     111     126    EM22:   .ASCIZ  /DIVD (R),A DIDN'T TRAP TO 244. FSRC-0 AND FID-0./
 5970 041745      104     111     126    EM23:   .ASCIZ  'DIVF (R),A FAILED.'
 5971 041770      106     120     123    EM32:   .ASCIZ  'FPS BAD AFTER DIVF (R),A.'
 5975 042022                             EM24:
      042022      104     111     126            .ASCII  'DIVF (R),A FAILED.'
 5976 042044      050     102     125            .ASCIZ  '(BUT Y61) WENT TO STATE 006 INSTEAD OF 206.'
 5977 042120                             EM25:
      042120      104     111     126            .ASCII  'DIVF (R),A FAILED.'
 5978 042142      130     117     122            .ASCIZ  'XOR OF SIGN BITS FAILED STATE 470.'
 5979 042205                             EM26:
      042205      104     111     126            .ASCII  'DIVF (R),A FAILED.'
 5980 042227      050     102     125            .ASCIZ  '(BUT Y61) WENT TO STATE 206 INSTEAD OF 006.'
 5981          042120                     EM27=EM25
 5982 042303                             EM30:
      042303      104     111     126            .ASCII  'DIVF (R),A FAILED.'
 5983 042325      124     122     125            .ASCIZ  'TRUNCATION ERROR. FT-1.'
 5984 042355                             EM31:
      042355      104     111     126            .ASCII  'DIVF (R),A FAILED.'
 5985 042377      122     117     125            .ASCIZ  'ROUND ERROR. FT=0.'
 5986 042422      104     111     126    EM33:   .ASCIZ  'DIVD (R),A FAILED.'
 5987 042445      106     120     123    EM34:   .ASCIZ  'FPS BAD AFTER DIVD (R),A.'
 5991 042477                             EM35:
      042477      104     111     126            .ASCII  'DIVD (R),A FAILED.'<CRLF>
 5992 042522      124     122     125            .ASCIZ  'TRUNCATION ERROR. FT=1.'
 5993 042552                             EM36:
      042552      104     111     126            .ASCII  'DIVD (R),A FAILED.'<CRLF>
 5994 042575      122     117     125            .ASCIZ  'ROUND ERROR. FT-0.'
 5995 042620      115     125     114    EM37:   .ASCIZ  'MULF (R),A FAILED.'
 5999 042643      106     120     123    EM40:   .ASCIZ  'FPS BAD AFTER MULF (R),A.'
 6000 042675                             EM41:
      042675      115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
 6001 042720      123     111     107            .ASCIZ  'SIGN BIT BAD STATE 511.'
 6002 042750                             EM42:
      042750      115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
 6003 042773      116     117     122            .ASCII  'NORMALIZATION FAILED.'<CRLF>
 6004 043021      050     102     125            .ASCIZ  '(BUT Y62) STATE 252 WENT TO 044 INSTEAD OF 444.'
 6005 043101                             EM43:
      043101      115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
 6006 043124      116     117     122            .ASCII  'NORMALIZATION FAILED.'<CRLF>
 6007 043152      050     102     125            .ASCIZ  '(BUT Y62) STATE 252 WENT TO 444 INSTEAD OF 044.'
 6008 043232                             EM44:
      043232      115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
 6009 043255      122     117     125            .ASCIZ  'ROUND ERROR. FT=0.'
 6010 043300                             EM45:
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                043300  115  125  114          .ASCII  'MULF (R),A FAILED.'<CRLF>
6011            043323  124  122  125          .ASCIZ  'TRUNCATION ERROR. FT=1.'
6012            043353  106  120  123  EM46:   .ASCIZ  'FPS BAD AFTER MULD (R),A.'
6016            043405  115  125  114  EM246:  .ASCIZ  'MULD (R),A FAILED.'
6017            043430                EM47:
                043430  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6018            043453  102  101  104          .ASCII  'BAD CONSTANT USED IN THE MUL ALGORITHM.'
6019            043522  200  125  123          .ASCIZ  <CRLF>'USED 24 INSTEAD OF 56 STATE 020.'
6020            043564                EM50:
                043564  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6021            043607  124  122  125          .ASCIZ  'TRUNCATION ERROR. FT-1.'
6022            043637                FM51:
                043637  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6023            043662  122  117  125          .ASCIZ  'ROUND ERROR. FT=0.'
6024            043705                EM52:
                043705  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6025            043730  102  101  104          .ASCIZ  'BAD CONSTANT USED IN ROUNDING, FT-0.'
6026            043775  106  120  123  EM111:  .ASCIZ  'FPS BAD AFTER MULF (R),A. EXPECTED OVERFLOW.'
6027            044052  106  120  123  EM112:  .ASCIZ  'FPS BAD AFTER MULF (R),A. EXPECTED UNDERFLOW.'
6028            044130                EM113:
                044130  115  125  114          .ASCII  'MULF (R),A FAILED.'<CRLF>
6029            044153  105  130  120          .ASCIZ  'EXPECTING OVERFLOW, FIV=0.'
6030            044206                EM114:
                044206  115  125  114          .ASCII  'MULF (R),A FAILED.'<CRLF>
6031            044231  105  130  120          .ASCIZ  'EXPECTING UNDERFLOW, FIU=0.'
6032            044265  115  125  114  EM115:  .ASCIZ  'MULF (R),A TRAPPED TO 244 ON OVERFLOW. FIV-0.'
6033            044343  115  125  114  EM116:  .ASCIZ  'MULF (R),A TRAPPED TO 244 ON UNDERFLOW. FIU 0.'
6040            044422                EM117:
                044422  115  125  114          .ASCII  'MULF (R),A TRAPPED TO 244 ON UNDERFLOW. FIU=0.'
6041            044500  050  102  125          .ASCIZ  '(BUT FIU) STATE 331 WENT TO 155 INSTEAD OF 115.'
6042            044560                EM120:
                044560  115  125  114          .ASCII  'MULF (R),A TRAPPED TO 244 ON UNDERFLOW. FIU=0.'
6043            044636  050  102  125          .ASCIZ  '(BUT FIU) STATE 137 WENT TO 155 INSTEAD OF 115.'
6044            044716                EM121:
                044716  115  125  114          .ASCII  'MULF (R),A TRAPPED TO 244 ON OVERFLOW. FIV 0.'
6045            044773  050  102  125          .ASCIZ  '(BUT FIV) STATE 333 WENT TO 136 INSTEAD OF 116.'
6046            045053                EM122:
                045053  115  125  114          .ASCII  'MULF (R),A TRAPPED TO 244 ON OVERFLOW. FIV=0.'
6047            045130  050  102  125          .ASCIZ  '(BUT FIV) STATE 133 WENT TO 136 INSTEAD OF 116.'
6048            045210  106  120  123  EM123:  .ASCIZ  'FPS BAD AFTER MULD (R),A. EXPECTING OVERFLOW.'
6049            045266  106  120  123  EM124:  .ASCIZ  'FPS BAD AFTER MULD (R),A. EXPECTING UNDERFLOW.'
6050            045345                EM125:
                045345  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6051            045370  105  130  120          .ASCIZ  'EXPECTING OVERFLOW, FIV=0.'
6052            045423                EM126:
                045423  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6053            045446  105  130  120          .ASCIZ  'EXPECTING UNDERFLOW, FIU=0.'
6054            045502  115  125  114  EM127:  .ASCIZ  'MULD (R),A TRAPPED TO 244 ON OVERFLOW. FIV 0.'
6055            045560  115  125  114  EM130:  .ASCIZ  'MULD (R),A TRAPPED TO 244 ON UNDERFLOW. FIU=0.'
6062            045637                EM131:
                045637  115  125  114          .ASCII  'MULF (R),A TRAPPED TO 244 ON UNDERFLOW. FIU=0.'
6063            045715  050  102  125          .ASCIZ  '(BUT FIU) STATE 331 WENT TO 155 INSTEAD OF 115.'
6064            045775                EM132:
                045775  115  125  114          .ASCII  'MULD (R),A FAILED.'<CRLF>
6065            046020  105  130  120          .ASCII  'EXPECTING UNDERFLOW, FIU=0.'
6066            046053  200  050  102          .ASCIZ  <CRLF>'(BUT FD) STATE 115 WENT TO 424 INSTEAD OF 425.'
6067            046133                EM133:
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      046133     115     125     114            .ASCII  'MULF (R),A TRAPPED TO 244 ON UNDERFLOW. FIU=0.'
6068  046211     050     102     125            .ASCIZ  '(BUT FIU) STATE 137 WENT TO 155 INSTEAD OF 115.'
6069  046271                             EM134:
      046271     115     125     114            .ASCII  'MULD (R),A TRAPPED TO 244 ON OVERFLOW. FIV=0.'
6070  046346     050     102     125            .ASCIZ  '(BUT FIV) STATE 333 WENT TO 136 INSTEAD OF 116.'
6071  046426                             EM135:
      046426     115     125     114            .ASCII  'MULD (R),A FAILED.'<CRLF>
6072  046451     105     130     120            .ASCII  'EXPECTING OVERFLOW, FIV=0.'
6073  046503     200     050     102            .ASCIZ  <CRLF>'(BUT FD) STATE 116 WENT TO 424 INSTEAD OF 425.'
6074  046563                             EM136:
      046563     115     125     114            .ASCII  'MULD (R),A TRAPPED TO 244 ON OVERFLOW. FIV=0.'
6075  046640     050     102     125            .ASCIZ  '(BUT FIV) STATE 133 WENT TO 136 INSTEAD OF 116.'
6076  046720     106     105     103  EM137:    .ASCIZ  'FEC BAD AFTER MULF (R),A. EXPECTING OVERFLOW, FEC=10.'
6077  047006     106     105     103  EM140:    .ASCIZ  'FEC BAD AFTER MULF (R),A. EXPECTING UNDERFLOW, FEC 12.'
6078          043775                   EM141=EM111
6079          044052                   EM142=EM112
6080  047075                             EM143:
      047075     115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
6081  047120     105     130     120            .ASCIZ  'EXPECTING OVERFLOW, FIV=1.'
6082  047153                             EM144:
      047153     115     125     114            .ASCII  'MULF (R),A FAILED.'<CRLF>
6083  047176     105     130     120            .ASCIZ  'EXPECTING UNDERFLOW, FIU=1.'
6090  047232                             EM145:
      047232     115     125     114            .ASCII  'MULF (R),A FAILED TO TRAP TO 244 ON UNDERFLOW. FIU=1.'
6091  047317     050     102     125            .ASCIZ  '(BUT FIU) STATE 331 WENT TO 115 INSTEAD OF 155.'
6092  047377                             EM146:
      047377     115     125     114            .ASCII  'MULF (R),A FAILED TO TRAP TO 244 ON UNDERFLOW. FIU 1.'
6093  047464     050     102     125            .ASCIZ  '(BUT FIU) STATE 137 WENT TO 115 INSTEAD OF 155.'
6094  047544                             EM147:
      047544     115     125     114            .ASCII  'MULF (R),A FAILED TO TRAP TO 244 ON OVERFLOW. FIV 1.'
6095  047630     050     102     125            .ASCIZ  '(BUT FIV) STATE 333 WENT TO 116 INSTEAD OF 136.'
6096  047710                             EM150:
      047710     115     125     114            .ASCII  'MULF (R),A FAILED TO TRAP TO 244 ON OVERFLOW. FIV-1.'
6097  047774     050     102     125            .ASCIZ  '(BUT FIV) STATE 133 WENT TO 116 INSTEAD OF A36.'
6098  050054     106     105     103  EM151:    .ASCIZ  'FEC BAD AFTER MULD (R),A. EXPECTING OVERFLOW, FEC=10.'
6099  050142     106     105     103  EM152:    .ASCIZ  'FEC BAD AFTER MULD (R),A. EXPECTING UNDERFLOW, FEC-12.'
6100          045210                   EM153=EM123
6101          045266                   EM154=EM124
6102  050231                             EM155:
      050231     115     125     114            .ASCII  'MULD (R),A FAILED.'<CRLF>
6103  050254     105     130     120            .ASCIZ  'EXPECTING OVERFLOW, FIV-1.'
6104  050307                             EM156:
      050307     115     125     114            .ASCII  'MULD (R),A FAILED.'<CRLF>
6105  050332     105     130     120            .ASCIZ  'EXPECTING UNDERFLOW, FIU=1.'
6112  050366                             EM157:
      050366     115     125     114            .ASCII  'MULD (R),A FAILED TO TRAP TO 244 ON UNDERFLOW. FIU 1.'
6113  050453     050     102     125            .ASCIZ  '(BUT FIU) STATE 331 WENT TO 115 INSTEAD OF 155.'
6114  050533                             EM160:
      050533     115     125     114            .ASCII  'MULD (R),A FAILED.'<CRLF>
6115  050556     105     130     120            .ASCII  'EXPECTING UNDERFLOW, FIU-1.'
6116  050611     200     050     102            .ASCIZ  <CRLF>'(BUT FD) STATE 155 WENT TO 426 INSTEAD OF 427.'
6117  050671                             EM161:
      050671     115     125     114            .ASCII  'MULD (R),A FAILED TO TRAP TO 244 ON UNDERFLOW. FIU-1.'
6118  050756     050     102     125            .ASCIZ  '(BUT FIU) STATE 137 WENT TO 115 INSTEAD OF 155.'
6119  051036                             EM162:
      051036     115     125     114            .ASCII  'MULD (R),A FAILED TO TRAP TO 244 ON OVERFLOW. FIV=1.'
6120  051122     050     102     125            .ASCIZ  '(BUT FIV) STATE 333 WENT TO 116 INSTEAD OF 136.'
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6121 051202                                EM163:
     051202  115  125  114                        .ASCII  'MULD (R),A FAILED.'<CRLF>
6122 051225  105  130  120                        .ASCII  'EXPECTING OVERFLOW, FIV-1.'
6123 051257  200  050  102                        .ASCIZ  <CRLF>'(BUT FD) STATE 700 WENT TO 426 INSTEAD OF 427.'
6124 051337                                EM164:
     051337  115  125  114                        .ASCII  'MULD (R),A FAILED TO TRAP TO 244 ON OVERFLOW. FIV=1.'
6125 051423  050  102  125                        .ASCIZ  '(BUT FIV) STATE 133 WENT TO 116 INSTEAD OF 136.'
6126 051503  106  120  123  EM55:                 .ASCIZ  'FPS BAD AFTER MODF (R),A.'
6127 051535  115  117  104  EM53:                 .ASCIZ  'MODF (R),A FRACTION BAD.'
6128 051566  115  117  104  EM54:                 .ASCIZ  'MODF (R),A INTEGER BAD.'
6135 051616                                EM56:
     051616  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6136 051647  101  103  060                        .ASCIZ  'AC0 DID NOT GET 0 IN STATE 424.'
6137 051707                                EM57:
     051707  115  117  104                        .ASCII  'MODF (R),A INTEGER BAD.'<CRLF>
6138 051737  101  103  061                        .ASCIZ  'AC1 DID NOT GET 0 IN STATE 142.'
6139 051777                                EM60:
     051777  115  117  104                        .ASCII  'MODF (R),A INTEGER BAD.'<CRLF>
6140 052027  101  103  061                        .ASCIZ  'AC1 DID NOT GET THE INTEGER IN STATE 134.'
6141 052101                                EM61:
     052101  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6142 052132  101  040  102                        .ASCII  'A BAD CONSTANT WAS USED (NOT 24) IN STATE 046.'
6143 052210  200  117  122                        .ASCIZ  <CRLF>'OR (BUT NBIT) STATE 525 WENT TO 050 INSTEAD OF 150.'
6144 052275                                EM62:
     052275  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6145 052326  101  040  102                        .ASCII  'A BAD CONSTANT WAS USED (NOT 24) IN STATE 046.'
6146 052404  200  117  122                        .ASCIZ  <CRLF>'OR (BUT NBIT) STATE 525 WENT TO 150 INSTEAD OF 050.'
6147 052471                                EM63:
     052471  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6148 052522  050  102  125                        .ASCIZ  '(BUT ZBT) STATE 532 WENT TO 10  INSTEAD OF 122.'
6149 052602                                EM64:
     052602  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6150 052633  050  102  125                        .ASCIZ  '(BUT ENBT EZBT) STATE 041 WENT TO 046 INSTEAD OF 246.'
6151 052721                                EM65:
     052721  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6152 052752  050  102  125                        .ASCIZ  '(BUT FT) STATE 126 SHOULD HAVE GONE TO 133. FT 0.'
6153 053034                                EM66:
     053034  115  117  104                        .ASCII  'MODF (R),A FRACTION BAD.'<CRLF>
6154 053065  123  111  107                        .ASCIZ  'SIGN BIT BAD.'
6155 053103                                EM67:
     053103  115  117  104                        .ASCII  'MODF (R),A INTEGER BAD.'<CRLF>
6156 053133  123  111  107                        .ASCIZ  'SIGN BIT BAD IN STATE 733.'
6157 053166  115  117  104  EM70:                 .ASCIZ  'MODD (R),A FRACTION BAD.'
6158 053217  115  117  104  EM71:                 .ASCIZ  'MODD (R),A INTEGER BAD.'
6159 053247  106  120  123  EM72:                 .ASCIZ  'FPS BAD AFTER MODD (R),A.'
6160         053247          EM73=EM72
6167 053301                                EM74:
     053301  115  117  104                        .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6168 053331  050  102  125                        .ASCIZ  '(BUT FD) STATE 231 WENT TO 142 INSTEAD OF 143.'
6169 053410                                EM75:
     053410  115  117  104                        .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
6170 053441  101  103  060                        .ASCIZ  'AC0 GETS 0 IN STATE 425 FAILED.'
6171 053501                                EM76:
     053501  115  117  104                        .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6172 053531  101  103  061                        .ASCIZ  'AC1 GETS 0 IN STATE 143 FAILED.'
6173 053571                                EM77:
     053571  115  117  104                        .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
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6174 053622  050  102  125          .ASCIZ  '(BUT FD) STATE 526 WENT TO 134 INSTEAD OF 135.'
6175 053701                  EM100:
     053701  115  117  104          .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6176 053731  123  111  107          .ASCIZ  'SIGN BIT BAD IN STATE 526.'
6177 053764                  EM101:
     053764  115  117  104          .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
6178 054015  101  040  102          .ASCII  'A BAD CONSTANT WAS USED (NOT 56) IN STATE 046,'
6179 054073  200  117  122          .ASCIZ  <CRLF>'OR (BUT NBIT) STATE 525 WENT TO 050 INSTEAD OF 150.'
6180 054160                  EM102:
     054160  115  117  104          .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
6181 054211  101  040  102          .ASCII  'A BAD CONSTANT WAS USED (NOT 56) IN STATE 046,'
6182 054267  200  117  122          .ASCIZ  <CRLF>'OR (BUT NBIT) STATE 525 WENT TO 150 INSTEAD OF 050.'
6183 054354                  EM103:
     054354  115  117  104          .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
6184 054405  050  102  125          .ASCIZ  '(BUT ZBIT) STATE 532 WENT TO 122 INSTEAD OF 102.'
6185 054466                  EM104:
     054466  115  117  104          .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6186 054516  123  105  124          .ASCII  'SET INTEGER IN AC1 FAILED,'
6187 054550  200  117  122          .ASCIZ  <CRLF>'OR (BUT FD) STATE 733 WENT TO 156 INSTEAD OF 157.'
6188 054633                  EM105:
     054633  115  117  104          .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6189 054663  050  102  125          .ASCIZ  '(BUT FD) STATE 122 WENT TO 424 INSTEAD OF 425.'
6190 054742                  EM106:
     054742  115  117  104          .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6191 054772  050  102  125          .ASCIZ  '(BUT FD) STATE 246 WENT TO 126 INSTEAD OF 127.'
6192 055051                  EM107:
     055051  115  117  104          .ASCII  'MODD (R),A INTEGER BAD.'<CRLF>
6193 055101  050  102  125          .ASCIZ  '(BUT FD) STATE 446 WENT TO 126 INSTEAD OF 127.'
6194 055160                  EM110:
     055160  115  117  104          .ASCII  'MODD (R),A FRACTION BAD.'<CRLF>
6195 055211  050  102  125          .ASCIZ  '(BUT FT) STATE 127 WENT TO 313 INSTEAD OF 113.'
6208 055270                  EM165:
     055270  115  117  104          .ASCII  /MODF (R),A FRACTION BAD. RESULT OVER OR UNDER FLOW./
6209 055353  000                    .BYTE   0
6210 055354                  EM166:
     055354  115  117  104          .ASCII  /MODF (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6211 055436  000                    .BYTE   0
6212 055437                  EM167:
     055437  106  120  123          .ASCII  /FPS BAD AFTER MODF (R),A./
6213 055470  000                    .BYTE   0
6214 055471                  EM170:
     055471  106  105  103          .ASCII  /FEC BAD AFTER MODF (R),A./
6215 055522  105  130  120          .ASCIZ  'EXPECTING UNDERFLOW, FEC=12.'
6216 055557                  EM171:
     055557  115  117  104          .ASCII  /MODF (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6217 055641  200  101  103          .ASCIZ  <CRLF>'AC1 GETS 0 IN STATE 126 FAILED.'
6218 055702                  EM172:
     055702  106  105  103          .ASCII  /FEC BAD AFTER MODF (R),A./
6219 055733  105  130  120          .ASCIZ  'EXPECTING OVERFLOW, FEC=10.'
6220 055767                  EM173:
     055767  115  117  104          .ASCII  /MODF (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6221 056051  200  050  102          .ASCIZ  <CRLF>'(BUT FIV FD) STATE 520 WENT TO 142 INSTEAD OF 162.'
6222 056135                  EM174:
     056135  115  117  104          .ASCII  /MODF (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6223 056217  200  050  102          .ASCIZ  <CRLF>'(BUT FIV FD) STATE 520 WENT TO 162 INSTEAD OF 142.'
6224 056303                  EM175:
     056303  115  117  104          .ASCII  /MODF (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
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6225 056365  200  123  111          .ASCIZ  <CRLF>'SIGN BAD IN STATE 517.'
6226 056415                  EM176:
     056415  115  117  104          .ASCII  /MODD (R),A FRACTION BAD. RESULT OVER OR UNDER FLOW./
6227 056500  000                    .BYTE   0
6228 056501                  EM177:
     056501  115  117  104          .ASCII  /MODD (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6229 056563  000                    .BYTE   0
6230 056564                  EM200:
     056564  106  120  123          .ASCII  /FPS BAD AFTER MODD (R),A./
6231 056615  000                    .BYTE   0
6232 056616                  EM201:
     056616  106  105  103          .ASCII  /FEC BAD AFTER MODD (R),A./
6233 056647  200  105  130          .ASCIZ  <CRLF>'EXPECTING UNDERFLOW, FEC-12.'
6234 056705                  EM202:
     056705  115  117  104          .ASCII  /MODD (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6235 056767  200  050  102          .ASCIZ  <CRLF>'(BUT FD) STATE 241 WENT TO 126 INSTEAD OF 127.'
6236 057047                  EM203:
     057047  115  117  104          .ASCII  /MODD (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6237 057131  200  050  102          .ASCIZ  <CRLF>'(BUT FD) STATE 047 WENT TO 126 INSTEAD OF 127.'
6238 057211                  EM204:
     057211  106  105  103          .ASCII  /FEC BAD AFTER MODD (R),A./
6239 057242  200  105  130          .ASCIZ  <CRLF>'EXPECTING OVERFLOW, FEC=10.'
6240 057277                  EM205:
     057277  115  117  104          .ASCII  /MODD (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6241 057361  200  050  102          .ASCIZ  <CRLF>'(BUT FIV FD) STATE 520 WENT TO 162 INSTEAD OF 163.'
6242 057445                  EM206:
     057445  115  117  104          .ASCII  /MODD (R),A INTEGER BAD. RESULT OVER OR UNDER FLOW./
6243 057527  200  050  102          .ASCIZ  <CRLF>'(BUT FIV FD) STATE 520 WENT TO 162 INSTEAD OF 143.'
6244
6245                                ;*
6338 057613                  EM207:
     057613  101  104  104          .ASCIZ  /ADDD (R),A PRODUCED A BAD RESULT./
6339 057655                  EM210:
     057655  124  110  105          .ASCIZ  /THE FPS WAS BAD AFTER ADDD (R),A./
6340 057717  101  104  104  EM211:  .ASCII  'ADDD (R),A FAILED IN THE ROUND\TRUNK FLOWS.'
6341 057772  200  127  105          .ASCII  <CRLF>'WENT FROM STATE 663 TO 313,'<CRLF>
6342 060027  111  116  123          .ASCIZ  'INSTEAD OF FROM 663 TO 353.'
6367 060063                  EM212:
     060063  101  104  104          .ASCII  'ADDD (R),A FAILED IN THE ROUND\TRUNK FLOWS.'
     060136  200  124  110          .ASCII  <CRLF>'THE FPS WAS BAD.'<CRLF>
     060160  104  111  104          .ASCII  'DID NOT TAKE THE PATH:'<CRLF>
     060207  106  122  117          .ASCIZ  /FROM STATE 664, TO 505, TO 251./
6368 060247                  EM213:
     060247  101  104  104          .ASCII  'ADDD (R),A FAILED IN THE ROUND\TRUNK FLOWS.'
     060322  200  124  110          .ASCII  <CRLF>'THE FPS WAS BAD.'<CRLF>
     060344  104  111  104          .ASCII  'DID NOT TAKE THE PATH:'<CRLF>
     060373  106  122  117          .ASCIZ  /FROM STATE 664, TO 505, TO 253./
6369 060433                  EM214:
     060433  101  104  104          .ASCII  'ADDD (R),A FAILED IN THE ROUND\TRUNK FLOWS.'
     060506  200  124  110          .ASCII  <CRLF>'THE FPS WAS BAD.'<CRLF>
     060530  104  111  104          .ASCII  'DID NOT TAKE THE PATH:'<CRLF>
     060557  106  122  117          .ASCIZ  /FROM STATE 664, TO 705, TO 735./
6370 060617                  EM215:
     060617  101  104  104          .ASCII  'ADDD (R),A FAILED IN THE ROUND\TRUNK FLOWS.'
     060672  200  124  110          .ASCII  <CRLF>'THE FPS WAS BAD.'<CRLF>
     060714  104  111  104          .ASCII  'DID NOT TAKE THE PATH:'<CRLF>
     060743  106  122  117          .ASCIZ  /FROM STATE 664, TO 705, TO 737./
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                                                EM216:  .ASCII  'THE (BUT FIU FORK IN THE OVER\UNDER FLOWS FAILED. FIU -1.'
                                                        .ASCII  <CRLF>'WENT FROM STATE 331 TO 115.'<CRLF>
                                                        .ASCIZ  'INSTEAD OF FROM 331 TO 155.'
                                                EM217:  .ASCIZ  'ADDD (R)A TRAPPED TO 244,. FID=1.'
                                                EM220:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS AN OVERFLOW CONDITION BUT FIV= 0.'
                                                        .ASCIZ  <CRLF>/(BUT FIV) STATE 133 WENT TO 136 INSTEAD OF 116./
                                                        .ASCIZ  /INSTEAD OF FROM 133 TO 116./
                                                EM221:
                                                        .ASCII  /ADDD (R),A FAILED TO TRAP TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS A OVERFLOW CONDITION AND FIV=1.'<CRLF>
                                                        .ASCII  /THE (BUT FIV) FORK FAILED./<CRLF>
                                                        .ASCII  /WENT FROM STATE 133 TO 116./<CRLF>
                                                        .ASCIZ  /INSTEAD OF FROM 133 TO 136./
                                                EM222:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS AN UNDERFLOW CONDITION BUT FIU= 0.'
                                                        .ASCIZ  <CRLF>/(BUT FIU) STATE 331 WENT TO 155 INSTEAD OF 115./
                                                        .ASCIZ  /INSTEAD OF FROM 331 TO 115./
                                                EM223:
                                                        .ASCII  /ADDD (R),A FAILED TO TRAP TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS A UNDERFLOW CONDITION AND FIU-1.'<CRLF>
                                                        .ASCII  /THE (BUT FIU) FORK FAILED./<CRLF>
                                                        .ASCII  /WENT FROM STATE 331 TO 115./<CRLF>
                                                        .ASCIZ  /INSTEAD OF FROM 331 TO 155./
                                                EM224:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS AN UNDERFLOW CONDITION BUT FIU- 0.'
                                                        .ASCIZ  <CRLF>/(BUT FIU) STATE 137 WENT TO 155 INSTEAD OF 115./
                                                        .ASCIZ  /INSTEAD OF FROM 137 TO 115./
                                                EM225:
                                                        .ASCII  /ADDD (R),A FAILED TO TRAP TO 244./<CRLF>
                                                        .ASCII  'THE RESULT WAS A UNDERFLOW CONDITION AND FIU=1.'<CRLF>
                                                        .ASCII  /THE (BUT FIU) FORK FAILED./<CRLF>
                                                        .ASCII  /WENT FROM STATE 137 TO 115./<CRLF>
                                                        .ASCIZ  /INSTEAD OF FROM 137 TO 155./
                                                EM226:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./
                                                        .ASCII  <CRLF>'BECAUSE OF AN EXPECTED OVERFLOW CONDITION,'<CRLF>
                                                        .ASCIZ  'BUT THE FEC WAS BAD.'
                                                EM227:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./
                                                        .ASCII  <CRLF>'BECAUSE OF AN EXPECTED OVERFLOW CONDITION,'<CRLF>
                                                        .ASCIZ  'BUT THE FPS WAS BAD.'
                                                EM230:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./
                                                        .ASCII  <CRLF>'BECAUSE OF AN EXPECTED UNDERFLOW CONDITION,'<CRLF>
                                                        .ASCIZ  'BUT THE FEC WAS BAD.'
                                                EM231:
                                                        .ASCII  /ADDD (R),A TRAPPED TO 244./
                                                        .ASCII  <CRLF>'BECAUSE OF AN EXPECTED UNDERFLOW CONDITION,'<CRLF>
                                                        .ASCIZ  'BUT THE FPS WAS BAD.'
                                                EM232 EM210
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6393
6397
6404
6414
6415 063675                                    EM233:
     063675   114   104   103                        .ASCIZ  \LDCFD (R)+,A RESULT INCORRECT.\
6416 063734                                    EM234:
     063734   122   060   040                        .ASCII  \R0 BAD AFTER LDCFD (R)+,A.\
     063766   200   101   040                        .ASCIZ  <CRLF>'A BAD CONSTANT WAS USED.'
6417 064020                                    EM235:
     064020   120   103   040                        .ASCIZ  \PC BAD AFTER LDCFD #NUM,A. TRAP TO 4.\
6418 064066                                    EM236:
     064066   120   103   040                        .ASCIZ  \PC BAD AFTER LDCFD #NUM,A.\
6419 064121                                    EM237:
     064121   122   060   040                        .ASCII  \R0 BAD AFTER LDCDF (R)+,A.\
     064153   200   101   040                        .ASCIZ  <CRLF>'A BAD CONSTANT WAS USED.'
6420 064205                                    EM240:
     064205   106   120   123                        .ASCIZ  \FPS BAD AFTER LDCFD (R)+,A.\
6421 064241                                    EM241:
     064241   114   104   103                        .ASCII  \LDCFD (R)+,A FAILED.\
     064265   200   124   110                        .ASCII  <CRLF>'THE FD '
     064275   102   111   124                        .ASCII  'BIT WAS NOT COMPLIMENTED '
     064326   111   116   040                        .ASCIZ  'IN STATE 017.'
6422 064344                                    EM242:
     064344   106   120   123                        .ASCIZ  \FPS BAD AFTER LDCDF (R)+,A.\
6423 064400                                    EM243:
     064400   114   104   103                        .ASCII  \LDCDF (R)+,A FAILED.\
     064424   200   124   110                        .ASCII  <CRLF>'THE FD '
     064434   102   111   124                        .ASCII  'BIT WAS NOT COMPLIMENTED '
     064465   111   116   040                        .ASCIZ  'IN STATE 017.'
6424 064503                                    EM244:
     064503   114   104   103                        .ASCIZ  \LDCDF (R)+,A RESULT INCORRECT.\
6425
6426 064542   114   104   103  EM245:  .ASCII  'LDCFD (R),A FAILED.'
6427 064565   200   123   105          .ASCII  <CRLF>'SET SIGN FAILED '
6428 064606   111   116   040          .ASCIZ  'IN STATE 512.'
6429 064624   125   116   105  EM247:  .ASCIZ  'UNEXPECTED FPP TRAP TO 244.'
6430 064660   125   116   105  EM250:  .ASCIZ  'UNEXPECTED CPU TRAP TO 4.'
6431 064712   125   116   105  EM251:  .ASCIZ  'UNEXPECTED CPU TRAP TO 10.'
6432
6433 064745   103   117   122  EM252:  .ASCIZ  'CORRECT FLOWS INTERRUPT TEST MODULE FAILED TO INTERRUPT.'
6434
6438
6439 065036                                    EM253:
     065036   101   104   104                        .ASCIZ  /ADDD AC0,AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6440 065122                                    EM254:
     065122   101   104   104                        .ASCIZ  /ADDD (R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6441 065207                                    EM255:
     065207   101   104   104                        .ASCIZ  /ADDD (R0)+,AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6442 065275                                    EM256:
     065275   101   104   104                        .ASCIZ  /ADDD @(R0)+,AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6443 065364                                    EM257:
     065364   101   104   104                        .ASCIZ  /ADDD -(R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6444 065452                                    EM260:
     065452   101   104   104                        .ASCIZ  /ADDD @-(R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6445 065541                                    EM261:
     065541   101   104   104                        .ASCIZ  /ADDD NUM(R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
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6446 065631                          EM262:
     065631    101   104   104              .ASCIZ  /ADDD @NUM(R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6447 065722                          EM263:
     065722    104   111   126              .ASCIZ  /DIVD (R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6448 066007                          EM264:
     066007    115   125   114              .ASCIZ  /MULD (R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6449 066074                          EM265:
     066074    115   117   104              .ASCIZ  /MODD (R0),AC0 FAILED IN THE INTERRUPT CORRECT FLOWS./
6450
6451 066161    103   117   122    EM266:    .ASCIZ  'CORRECT FLOWS INTERRUPT TEST MODULE CAUSED UNEXPECTED INTERRUPT.'
6452
6453                                ;THESE ARE ERROR DATA TABLE HEADERS:
6454
6455 066262    040   040   124    DH1:      .ASCII  '  TEST.'<TAB>'CALL AT PC.'<TAB>'ERROR AT PC.'<TAB>
6456 066323    107   117   124              .ASCIZ  'GOT FPS.'<TAB>'EXPECTED FPS.'
6457 066352    040   040   124    DH2:      .ASCIZ  '  TEST.'<TAB>'CALL AT PC.'<TAB>'ERROR AT PC.'
6458          066262                DH3=DH1
6459          066262                DH4=DH1
6460          066262                DH5=DH1
6461          066262                DH6=DH1
6462          066262                DH7=DH1
6463          066262                DH10=DH1
6464          066262                DH11=DH1
6465          066262                DH12=DH1
6466          066262                DH13=DH1
6467          066262                DH14=DH1
6468          066262                DH15=DH1
6469          066262                DH16=DH1
6470 066413    040   040   124    DH17:     .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'<TAB>'FEC.'<TAB>'FPS.'
6471          066262                DH20=DH1
6472 066466    040   040   124    DH21:     .ASCII  '  TEST.'<TAB>'PC OF CALL'<TAB>'PC OF ERROR.'<TAB>
6473 066526    107   117   124              .ASCIZ  'GOT FEC.'<TAB>'EXPECTED FEC.'
6474 066555    040   040   124    DH22:     .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'<TAB>'FPS.'
6475          066262                DH23=DH1
6476          066262                DH32=DH1
6477          066262                DH24=DH1
6478          066262                DH25=DH1
6479          066262                DH26=DH1
6480          066262                DH27=DH1
6481          066262                DH30=DH1
6482          066262                DH31=DH1
6483          066262                DH33=DH1
6484          066262                DH34=DH1
6485          066262                DH35=DH1
6486          066262                DH36 DH1
6487          066262                DH37=DH1
6488          066262                DH40=DH1
6489          066262                DH41=DH1
6490          066262                DH42=DH1
6491          066262                DH43=DH1
6492          066262                DH44=DH1
6493          066262                DH45=DH1
6494          066262                DH246=DH1
6495          066262                DH46=DH1
6496          066262                DH47=DH1
6497          066262                DH50=DH1
6498          066262                DH51-DH1
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 6499            066262                  DH52=DH1
 6500            066262                  DH111=DH1
 6501            066262                  DH112=DH1
 6502            066262                  DH113=DH1
 6503            066262                  DH114=DH1
 6504 066623      040      040     124   DH115:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'<TAB>
 6505 066664      107      117     124           .ASCIZ  'GOT FEC.''GOT FPS.''EXPECTED FPS.'
 6506            066623                  DH116=DH115
 6507            066623                  DH117=DH115
 6508            066623                  DH120=DH115
 6509            066623                  DH121=DH115
 6510            066623                  DH122=DH115
 6511            066262                  DH123=DH1
 6512            066262                  DH124=DH1
 6513            066262                  DH125=DH1
 6514            066262                  DH126=DH1
 6515            066623                  DH127=DH115
 6516            066623                  DH130=DH115
 6517            066623                  DH131=DH115
 6518            066262                  DH132=DH1
 6519            066623                  DH133=DH115
 6520            066623                  DH134=DH115
 6521            066262                  DH135=DH1
 6522            066623                  DH136=DH115
 6523            066623                  DH137=DH115
 6524            066623                  DH140=DH115
 6525            066623                  DH141=DH115
 6526            066623                  DH142=DH115
 6527            066623                  DH143=DH115
 6528            066623                  DH144=DH115
 6529            066262                  DH145=DH1
 6530            066262                  DH146=DH1
 6531            066262                  DH147=DH1
 6532            066262                  DH150=DH1
 6533            066623                  DH151=DH115
 6534            066623                  DH152=DH115
 6535            066623                  DH153=DH115
 6536            066623                  DH154=DH115
 6537            066623                  DH155=DH115
 6538            066623                  DH156=DH115
 6539            066262                  DH157=DH1
 6540            066623                  DH160=DH115
 6541            066262                  DH161=DH1
 6542            066262                  DH162=DH1
 6543            066623                  DH163=DH115
 6544            066262                  DH164=DH1
 6545            066262                  DH53=DH1
 6546            066262                  DH54=DH1
 6547            066262                  DH55=DH1
 6548            066262                  DH56=DH1
 6549            066262                  DH57=DH1
 6550            066262                  DH60=DH1
 6551            066262                  DH61=DH1
 6552            066262                  DH62=DH1
 6553            066262                  DH63=DH1
 6554            066262                  DH64=DH1
 6555            066262                  DH65=DH1
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 6556          066262                  DH66=DH1
 6557          066262                  DH67=DH1
 6558          066262                  DH70=DH1
 6559          066262                  DH71=DH1
 6560          066262                  DH72=DH1
 6561          066262                  DH73=DH1
 6562          066262                  DH74=DH1
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6564            066262                  DH75=DH1
6565            066262                  DH76=DH1
6566            066262                  DH77=DH1
6567            066262                  DH100=DH1
6568            066262                  DH101=DH1
6569            066262                  DH102=DH1
6570            066262                  DH103=DH1
6571            066262                  DH104=DH1
6572            066262                  DH105=DH1
6573            066262                  DH106=DH1
6574            066262                  DH107=DH1
6575            066262                  DH110=DH1
6576            066623                  DH165=DH115
6577            066623                  DH166=DH115
6578            066623                  DH167=DH115
6579            066623                  DH170=DH115
6580            066623                  DH171=DH115
6581            066623                  DH172=DH115
6582            066623                  DH173=DH115
6583            066623                  DH174=DH115
6584            066623                  DH175=DH115
6585            066623                  DH176=DH115
6586            066623                  DH177=DH115
6587            066623                  DH200=DH115
6588            066623                  DH201=DH115
6589            066623                  DH202=DH115
6590            066623                  DH203=DH115
6591            066623                  DH204=DH115
6592            066623                  DH205=DH115
6593            066623                  DH206=DH115
6594 066722      040     040     124    DH220:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'
6595 066762      040     040     124    DH207:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'
6596 067022      011     107     117            .ASCIZ  <TAB>'GOT FPS.'<TAB>'EXPECTED FPS.'
6597 067052      040     040     124    DH210:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'
6598            067052                  DH211=DH210
6599            066762                  DH212=DH207
6600            066762                  DH213=DH207
6601            066762                  DH214=DH207
6602            066762                  DH215=DH207
6603            067052                  DH216=DH210
6604 067113      040     040     124    DH217:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'
6605 067153      011     106     120            .ASCIZ  <TAB>'FPS.'<TAB>'FEC.'
6606            067052                  DH221=DH210
6607            066722                  DH222=DH220
6608            067052                  DH223=DH210
6609            066722                  DH224=DH220
6610            067052                  DH225=DH210
6611 067166      040     040     124    DH226:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'
6612 067225      011     107     117            .ASCIZ  <TAB>'GOT FEC.'<TAB>'EXPECTED FEC.'
6613 067255      040     040     124    DH227:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'
6614 067314      011     107     117            .ASCIZ  <TAB>'GOT FPS.'<TAB>'EXPECTED FPS.'
6615            067166                  DH230=DH226
6616            067255                  DH231=DH227
6617            067255                  DH232=DH227
6618
6619
6620 067344      040     040     124    DH233:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'
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 6621                                                               
 6622 067405     040     040     124  DH234:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF ERROR.'
 6623 067445     011     107     117          .ASCIZ  <TAB>'GOT R0.'<TAB>'EXPECTED R0.'
 6624                                                               
 6625 067473     040     040     124  DH235:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>
 6626 067517     120     103     040          .ASCII  'PC OF TRAP.'<TAB>
 6627                                                               
 6628 067533     040     040     124  DH236:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>
 6629 067557     120     103     040          .ASCII  'PC OF ERROR.'<TAB>'GOT PC.'
 6630 067603     011     105     130          .ASCIZ  <TAB>'EXPECTED PC.'
 6631                                                               
 6632          067405                  DH237=DH234                  
 6633                                                               
 6634 067621     040     040     124  DH240:  .ASCII  '  TEST.'<TAB>'PC OF CALL.'<TAB>
 6635 067645     120     103     040          .ASCII  'PC OF ERROR.'<TAB>
 6636 067662     107     117     124          .ASCIZ  'GOT FPS.'<TAB>'EXPECTED FPS.'
 6637                                                               
 6638          067344                  DH241=DH233                  
 6639          067621                  DH242=DH240                  
 6640          067344                  DH243=DH233                  
 6641          067344                  DH244=DH233                  
 6642          067344                  DH245=DH233                  
 6643 067711     040     040     124  DH247:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'<TAB>'FEC.'
 6644 067756     040     040     124  DH250:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'
 6645          067756                  DH251=DH250                  
 6646                                                               
 6647          066352                  DH252=DH2                    
 6648          066262                  DH253=DH1                    
 6649          066262                  DH254=DH1                    
 6650          066262                  DH255=DH1                    
 6651          066262                  DH256=DH1                    
 6652          066262                  DH257=DH1                    
 6653          066262                  DH260=DH1                    
 6654          066262                  DH261=DH1                    
 6655          066262                  DH262=DH1                    
 6656          066262                  DH263=DH1                    
 6657          066262                  DH264=DH1                    
 6658          066262                  DH265=DH1                    
 6659 070016     040     040     124  DH266:  .ASCIZ  '  TEST.'<TAB>'PC OF CALL.'<TAB>'PC OF TRAP.'
 6660                                                               
 6661                                                               
 6662                                  ;THESE ARE THE DATA FORMAT SPECIFIERS FOR THE DATA TABLE:
 6663 070056     004     000     005  DF1:    .BYTE   4,0,5,0,5,0,5,0,5,5,3,5,5,3
 6664 070074     004     000     005  DF2:    .BYTE   4,0,5,0,5,5,3,5,5,3
 6665          070056                  DF3=DF1                      
 6666          070056                  DF4=DF1                      
 6667          070056                  DF5=DF1                      
 6668          070056                  DF6=DF1                      
 6669          070056                  DF7=DF1                      
 6670          070056                  DF10=DF1                     
 6671          070056                  DF11=DF1                     
 6672          070056                  DF12=DF1                     
 6673          070056                  DF13=DF1                     
 6674          070056                  DF14=DF1                     
 6675          070056                  DF15=DF1                     
 6676          070056                  DF16=DF1                     
 6677 070106     004     000     005  DF17:   .BYTE   4,0,5,0,5,0,0
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 6678 070115      004      000      005  DF20:    .BYTE   4,0,5,0,5,0,5,0
 6679           070115                    DF21=DF20
 6680           070115                    DF22=DF20
 6681 070125      004      000      005  DF23:    .BYTE   4,0,5,0,5,0,5,0,5,5,2,5,5,2,5,5,2,5,5,2
 6682           070125                    DF24=DF23
 6683           070125                    DF32=DF23
 6684           070125                    DF25=DF23
 6685           070125                    DF26=DF23
 6686           070125                    DF27=DF23
 6687           070125                    DF30=DF23
 6688           070125                    DF31=DF23
 6689 070151      004      000      005  DF33:    .BYTE   4,0,5,0,5,0,5,0,5,5,3,5,5,3,5,5,3,5,5,3
 6690           070151                    DF34=DF33
 6691           070151                    DF35=DF33
 6692           070151                    DF36=DF33
 6693           070125                    DF37=DF23
 6694           070125                    DF40=DF23
 6695           070125                    DF41=DF23
 6696           070125                    DF42=DF23
 6697           070125                    DF43=DF23
 6698           070125                    DF44=DF23
 6699           070125                    DF45=DF23
 6700           070151                    DF246=DF33
 6701           070151                    DF46=DF33
 6702           070151                    DF47=DF33
 6703           070151                    DF50=DF33
 6704           070151                    DF51=DF33
 6705           070151                    DF52=DF33
 6706           070125                    DF111=DF23
 6707           070125                    DF112=DF23
 6708           070125                    DF113=DF23
 6709           070125                    DF114=DF23
 6710 070175      004      000      005  DF115:   .BYTE   4,0,5,0,5,0,0,0,5,5,2,5,5,2,5,5,2,5,5,2
 6711           070175                    DF116=DF115
 6712           070175                    DF117=DF115
 6713           070175                    DF120=DF115
 6714           070175                    DF121=DF115
 6715           070175                    DF122=DF115
 6716           070151                    DF123=DF33
 6717           070151                    DF124=DF33
 6718           070151                    DF125=DF33
 6719           070151                    DF126=DF33
 6720 070221      004      000      005  DF127:   .BYTE   4,0,5,0,5,0,0,0,5,5,3,5,5,3,5,5,3,5,5,3
 6721           070221                    DF130=DF127
 6722           070221                    DF131=DF127
 6723           070151                    DF132=DF33
 6724           070221                    DF133=DF127
 6725           070221                    DF134=DF127
 6726           070151                    DF135=DF33
 6727           070221                    DF136=DF127
 6728           070175                    DF137=DF115
 6729           070175                    DF140=DF115
 6730           070175                    DF141=DF115
 6731           070175                    DF142=DF115
 6732           070175                    DF143=DF115
 6733           070175                    DF144=DF115
 6734           070125                    DF145=DF23
```

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 6735            070125                  DF146=DF23
 6736            070125                  DF147=DF23
 6737            070125                  DF150=DF23
 6738            070221                  DF151=DF127
 6739            070221                  DF152=DF127
 6740            070221                  DF153=DF127
 6741            070221                  DF154=DF127
 6742            070221                  DF155=DF127
 6743            070221                  DF156=DF127
 6744            070151                  DF157=DF33
 6745            070221                  DF160=DF127
 6746            070151                  DF161=DF33
 6747            070151                  DF162=DF33
 6748            070221                  DF163=DF127
 6749            070151                  DF164=DF33
 6750 070245       004       000   005   DF53:   .BYTE   4,0,5,0,5,0,5,0,5,5,2,5,5,2,5,5,2,5,5,2,5,5,2,5,5,2
 6751            070245                  DF54=DF53
 6752            070245                  DF55=DF53
 6753            070245                  DF56=DF53
 6754            070245                  DF57=DF53
 6755            070245                  DF60=DF53
 6756            070245                  DF61=DF53
 6757            070245                  DF62=DF53
 6758            070245                  DF63=DF53
 6759            070245                  DF64=DF53
 6760            070245                  DF65=DF53
 6761            070245                  DF66=DF53
 6762            070245                  DF67=DF53
 6763 070277       004       000   005   DF70:   .BYTE   4,0,5,0,5,0,5,0,5,5,3,5,5,3,5,5,3,5,5,3,5,5,3,5,5,3
 6764            070277                  DF71=DF70
 6765            070277                  DF72=DF70
 6766            070277                  DF73=DF70
 6767            070277                  DF74=DF70
 6768            070277                  DF75=DF70
 6769            070277                  DF76=DF70
 6770            070277                  DF77=DF70
 6771            070277                  DF100=DF70
 6772            070277                  DF101=DF70
 6773            070277                  DF102=DF70
 6774            070277                  DF103=DF70
 6775            070277                  DF104=DF70
 6776            070277                  DF105=DF70
 6777            070277                  DF106=DF70
 6778            070277                  DF107=DF70
 6779            070277                  DF110=DF70
 6780 070331       004       000   005   DF165:  .BYTE   4,0,5,0,5,0,0,0,5,5,2,5,5,2,5,5,2,5,5,2,5,5,2,5,5,2
 6781            070331                  DF166=DF165
 6782            070331                  DF167=DF165
 6783            070331                  DF170=DF165
 6784            070331                  DF171=DF165
 6785            070331                  DF172=DF165
 6786            070331                  DF173=DF165
 6787            070331                  DF174=DF165
 6788            070331                  DF175=DF165
 6789 070363       004       000   005   DF176:  .BYTE   4,0,5,0,5,0,0,0,5,5,3,5,5,3,5,5,3,5,5,3,5,5,3,5,5,3
 6790            070363                  DF177=DF176
 6791            070363                  DF200=DF176
```

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 6792            070363                  DF201=DF176
 6793            070363                  DF202=DF176
 6794            070363                  DF203=DF176
 6795            070363                  DF204=DF176
 6796            070363                  DF205=DF176
 6797            070363                  DF206=DF176
 6798 070415        004      000    005  DF210:  .BYTE   4,0,5,0,5,0,5,0
 6799 070425        004      000    005  DF207:  .BYTE   4,0,5,0,5,5,5,3,5,5,5,3,5,5,5,3,5,5,5,3
 6800            070425                  DF211=DF207
 6801 070451        004      000    005  DF212:  .BYTE   4,0,5,0,5,0,5,0,5,5,5,3,5,5,5,3,5,5,5,3,5,5,5,3
 6802            070451                  DF213=DF212
 6803            070451                  DF214=DF212
 6804            070451                  DF215=DF212
 6805            070425                  DF216=DF207
 6806 070501        004      000    005  DF217:  .BYTE   4,0,5,0,5,0,0
 6807            070425                  DF220=DF207
 6808            070425                  DF221=DF207
 6809            070425                  DF222=DF207
 6810            070425                  DF223=DF207
 6811            070425                  DF224=DF207
 6812            070425                  DF225=DF207
 6813            070451                  DF226=DF212
 6814            070451                  DF227=DF212
 6815            070451                  DF230=DF212
 6816            070451                  DF231=DF212
 6817            070451                  DF232=DF212
 6818 070510        004      000    005  DF233:  .BYTE   4,0,5,0,5,5,3,5,5,3,5,5,3
 6819 070525        004      000    005  DF234:  .BYTE   4,0,5,0,5,0,0
 6820
 6821 070534        004      000    005  DF235:  .BYTE   4,0,5,0
 6822            070525                  DF236=DF234
 6823            070525                  DF237=DF234
 6824            070525                  DF240=DF234
 6825            070510                  DF241=DF233
 6826            070525                  DF242=DF234
 6827            070510                  DF243=DF233
 6828            070510                  DF244=DF233
 6829            070510                  DF245=DF233
 6830 070540        004      000    005  DF247:  .BYTE   4,0,5,0,5,0
 6831            070540                  DF250=DF247
 6832            070540                  DF251=DF247
 6833
 6834 070546        004      000    005  DF252:  .BYTE   4,0,5,0
 6835 070552        004      000    005  DF253:  .BYTE   4,0,5,0,5,0,5,0,5,5,0,5,5,0,5,5,0,5,5,0,5,5,0,5,5,3,5,5,3
 6836            070552                  DF254=DF253
 6837            070552                  DF255=DF253
 6838            070552                  DF256=DF253
 6839            070552                  DF257=DF253
 6840            070552                  DF260=DF253
 6841            070552                  DF261=DF253
 6842            070552                  DF262=DF253
 6843            070552                  DF263=DF253
 6844            070552                  DF264=DF253
 6845            070552                  DF265=DF253
 6846            070546                  DF266=DF252
 6847
 6848
```

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                                        .EVEN

                                ;THESE ARE ERROR DATA TABLES (FORMATTED ABOVE):
070604  001232  001234  037215  DT1:    .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP5,$TAB,$TMP6
070624  001313  037222  001240          .WORD   $CRLF,MS1,$TMP3,$CRLF,MS2,$TMP4,0
070642  001232  001234  037215  DT2:    .WORD   $TMP0,$TMP1,$TAB,$TMP2,$CRLF,MS3,$TMP3,$CRLF,MS4,$TMP4,0
        070604                  DT3=DT1
        070604                  DT4=DT1
        070604                  DT5=DT1
        070604                  DT6=DT1
        070604                  DT7=DT1
        070604                  DT10=DT1
        070604                  DT11=DT1
        070604                  DT12=DT1
        070604                  DT13=DT1
        070604                  DT14=DT1
        070604                  DT15=DT1
        070604                  DT16=DT1
070670  001232  001234  037215  DT17:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP4,$TMP5,0
070710  001232  001234  037215  DT20:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP4,$TAB,$TMP5,0
070732  001232  001234  037215  DT21:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP4,$TAB,$TMP3,0
070754  001232  001234  037215  DT22:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP5,0
070772  001232  001234  037215  DT23:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP7,$TAB,$TMP10,$CRLF,MS1,$TMP3,$CRLF,MS2,$TMP
071026  001313  037335  001244          .WORD   $CRLF,MS5,$TMP5,$CRLF,MS6,$TMP6,0
        070772                  DT32=DT23
        070772                  DT24=DT23
        070772                  DT25=DT23
        070772                  DT26=DT23
        070772                  DT27=DT23
        070772                  DT30=DT23
        070772                  DT31=DT23
        070772                  DT33=DT23
        070772                  DT34=DT23
        070772                  DT35=DT23
        070772                  DT36=DT23
        070772                  DT37=DT23
        070772                  DT40=DT23
        070772                  DT41=DT23
        070772                  DT42=DT23
        070772                  DT43=DT23
        070772                  DT44=DT23
        070772                  DT45=DT23
        070772                  DT246=DT23
        070772                  DT46=DT23
        070772                  DT47=DT23
        070772                  DT50=DT23
        070772                  DT51=DT23
        070772                  DT52=DT23
        070772                  DT111=DT23
        070772                  DT112=DT23
        070772                  DT113=DT23
        070772                  DT114=DT23
071044  001232  001234  037215  DT115:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP11,$TMP7,$TAB,$TMP10
071066  001313  037222  001240          .WORD   $CRLF,MS1,$TMP3,$CRLF,MS2,$TMP4
071102  001313  037335  001244          .WORD   $CRLF,MS5,$TMP5,$CRLF,MS6,$TMP6,0
        071044                  DT116=DT115
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 6906            071044                  DT117=DT115
 6907            071044                  DT120=DT115
 6908            071044                  DT121=DT115
 6909            071044                  DT122=DT115
 6910            070772                  DT123=DT23
 6911            070772                  DT124=DT23
 6912            070772                  DT125=DT23
 6913            070772                  DT126=DT23
 6914            071044                  DT127=DT115
 6915            071044                  DT130=DT115
 6916            071044                  DT131=DT115
 6917            070772                  DT132=DT23
 6918            071044                  DT133=DT115
 6919            071044                  DT134=DT115
 6920            070772                  DT135=DT23
 6921            071044                  DT136=DT115
 6922            071044                  DT137=DT115
 6923            071044                  DT140=DT115
 6924            071044                  DT141=DT115
 6925            071044                  DT142=DT115
 6926            071044                  DT143=DT115
 6927            071044                  DT144=DT115
 6928            070772                  DT145=DT23
 6929            070772                  DT146=DT23
 6930            070772                  DT147=DT23
 6931            070772                  DT150=DT23
 6932            071044                  DT151=DT115
 6933            071044                  DT152=DT115
 6934            071044                  DT153=DT115
 6935            071044                  DT154=DT115
 6936            071044                  DT155=DT115
 6937            071044                  DT156=DT115
 6938            070772                  DT157=DT23
 6939            071044                  DT160=DT115
 6940            070772                  DT161=DT23
 6941            070772                  DT162=DT23
 6942            071044                  DT163=DT115
 6943            070772                  DT164=DT23
 6944 071120    001232  001234  037215  DT53:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP11,$TAB,$TMP12
 6945 071140    001313  037222  001240          .WORD   $CRLF,MS1,$TMP3,$CRLF,MS2,$TMP4
 6946 071154    001313  037443  001244          .WORD   $CRLF,MS11,$TMP5,$CRLF,MS12,$TMP6
 6947 071170    001313  037375  001250          .WORD   $CRLF,MS7,$TMP7,$CRLF,MS10,$TMP10,0
 6948            071120                  DT54=DT53
 6949            071120                  DT55=DT53
 6950            071120                  DT56=DT53
 6951            071120                  DT57=DT53
 6952            071120                  DT60=DT53
 6953            071120                  DT61=DT53
 6954            071120                  DT62=DT53
 6955            071120                  DT63=DT53
 6956            071120                  DT64=DT53
 6957            071120                  DT65=DT53
 6958            071120                  DT66=DT53
 6959            071120                  DT67=DT53
 6960            071120                  DT70=DT53
 6961            071120                  DT71=DT53
 6962            071120                  DT72=DT53
```

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 6963           071120                  DT73=DT53
 6964           071120                  DT74=DT53
 6965           071120                  DT75=DT53
 6966           071120                  DT76=DT53
 6967           071120                  DT77=DT53
 6968           071120                  DT100=DT53
 6969           071120                  DT101=DT53
 6970           071120                  DT102=DT53
 6971           071120                  DT103=DT53
 6972           071120                  DT104=DT53
 6973           071120                  DT105=DT53
 6974           071120                  DT106=DT53
 6975           071120                  DT107=DT53
 6976           071120                  DT110=DT53
 6977 071206   001232  001234  037215  DT165:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP13,$TMP11,$TMP12
 6978 071226   001313  037222  001240          .WORD   $CRLF,MS1,$TMP3,$CRLF,MS2,$TMP4
 6979 071242   001313  037443  001244          .WORD   $CRLF,MS11,$TMP5,$CRLF,MS12,$TMP6
 6980 071256   001313  037375  001250          .WORD   $CRLF,MS7,$TMP7,$CRLF,MS10,$TMP10,0
 6981           071206                  DT166=DT165
 6982           071206                  DT167=DT165
 6983           071206                  DT170=DT165
 6984           071206                  DT171=DT165
 6985           071206                  DT172=DT165
 6986           071206                  DT173=DT165
 6987           071206                  DT174=DT165
 6988           071206                  DT175=DT165
 6989           071206                  DT176=DT165
 6990           071206                  DT177=DT165
 6991           071206                  DT200=DT165
 6992           071206                  DT201=DT165
 6993           071206                  DT202=DT165
 6994           071206                  DT203=DT165
 6995           071206                  DT204=DT165
 6996           071206                  DT205=DT165
 6997           071206                  DT206=DT165
 6998
 6999 071274   001232  001234  037215  DT210:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP3
 7000 071310   037215  001242  000000          .WORD   $TAB,$TMP4,0
 7001 071316   001232  001234  037215  DT207:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$CRLF,MS41,$CRLF,$TMP3
 7002 071336   001313  037610  001313          .WORD   $CRLF,MS42,$CRLF,$TMP4,$CRLF,MS43,$CRLF,$TMP5
 7003 071356   001313  037643  001313          .WORD   $CRLF,MS44,$CRLF,$TMP6,0
 7004           071316                  DT211=DT207
 7005 071370   001232  001234  037215  DT212:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP10,$TAB,$TMP11
 7006 071410   001313  037564  001313          .WORD   $CRLF,MS41,$CRLF,$TMP3,$CRLF,MS42,$CRLF,$TMP4
 7007 071430   001313  037626  001313          .WORD   $CRLF,MS43,$CRLF,$TMP5,$CRLF,MS44,$CRLF,$TMP6,0
 7008           071370                  DT213=DT212
 7009           071370                  DT214=DT212
 7010           071370                  DT215=DT212
 7011           071316                  DT216=DT207
 7012 071452   001232  001234  037215  DT217:  .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP3,$TMP4,0
 7013           071316                  DT220=DT207
 7014           071316                  DT221=DT207
 7015           071316                  DT222=DT207
 7016           071316                  DT223=DT207
 7017           071316                  DT224=DT207
 7018           071316                  DT225=DT207
 7019           071370                  DT226=DT212
```

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                071370                  DT227=DT212
                071370                  DT230=DT212
                071274                  DT231=DT210
                071316                  DT232=DT207
                                        
                                        
                                        
                                        
                                        
071472  001232  001234  037215  DT233:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$CRLF
071504  037512  001244  001313          .WORD   MS37,$TMP5,$CRLF,MS40,$TMP6
071516  001313  037564  001250          .WORD   $CRLF,MS41,$TMP7,0
                                        
071526  001232  001234  037215  DT234:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP3,$TMP4,0
                                        
071546  001232  001234  037215  DT235:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,0
                                        
                071526                  DT236=DT234
                071526                  DT237=DT234
                071526                  DT240=DT234
                071472                  DT241=DT233
                071526                  DT242=DT234
                071472                  DT243=DT233
                071472                  DT244=DT233
                071472                  DT245=DT233
071560  001232  001234  037215  DT247:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP3,0
071576  001232  001234  037215  DT250:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,0
                071576                  DT251=DT250
                                        
071610  001232  001234  037215  DT252:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,0
                                        
071622  001232  001234  037215  DT253:   .WORD   $TMP0,$TMP1,$TAB,$TMP2,$TAB,$TMP7,$TAB,$TMP10
071642  001313  037024  001254          .WORD   $CRLF,MSA1,$TMP11,$CRLF,MSA2,$TMP12
071656  001313  037065  001244          .WORD   $CRLF,MSA3,$TMP5,$CRLF,MSA4,$TMP6
071672  001313  037115  001240          .WORD   $CRLF,MSA5,$TMP3,$CRLF,MSA6,$TMP4,0
                071622                  DT254=DT253
                071622                  DT255=DT253
                071622                  DT256=DT253
                071622                  DT257=DT253
                071622                  DT260=DT253
                071622                  DT261=DT253
                071622                  DT262=DT253
                071622                  DT263=DT253
                071622                  DT264=DT253
                071622                  DT265-DT253
                                        
                071610                  DT266-DT252
                                        
                                        
                                        
                                        
                                        ;12345
                000001                          .END
```

```
AAADON  014406
AAA1    013404
AAA10   014022
AAA11   014060
AAA12   014116
AAA13   014154
AAA2    013442
AAA3    013500
AAA4    013536
AAA5    013574
AAA6    013632
AAA7    013670
AAA8    013726
AAA9    013764
ABASE = 000000
ACDW1 = 000000
ACDW2 = 000000
ACPUOP= 000000
AC0   =%000000
AC1   =%000001
AC2   =%000002
AC3   =%000003
AC4   =%000004
AC5   =%000005
AC6   =%000006
AC7   =%000007
ADDW0 = 000000
ADDW1 = 000000
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 = 000000
ADDW8 = 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
AENV  = 000000
AENVM = 000000
AFATAL- 000000
AMADR1= 000000
AMADR2= 000000
AMADR3= 000000
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4= 000000
AMSGAD= 000000
AMSGLG- 000000
AMSGTY= 000000
AMTYP1= 000000
AMTYP2= 000000
AMTYP3= 000000
AMTYP4= 000000
APASS = 000000
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPO= 000100
ASWREG= 000000
ATESTN= 000000
AUNIT = 000000
AUSWR = 000000
AVECT1= 000000
AVECT2= 000000
BBBDON  015110
BBBER1  014664
BBBER2  014750
BBBER3  014776
BBBER4  015024
BBBP1   015070
BBBP2   015100
BBB0    014414
BBB1    014450
BBB2    014476
BBB3    014526
BBB4    014554
BBB5    014612
BBB6    014620
BIT0  = 000001
BIT00 = 000001
BIT01 = 000002
BIT02 = 000004
BIT03 = 000010
BIT04 = 000020
BIT05 = 000040
BIT06 = 000100
BIT07 = 000200
BIT08 = 000400
BIT09 = 001000
BIT1  = 000002
BIT10 = 002000
BIT11 = 004000
BIT12 = 010000
BIT13 = 020000
BIT14 = 040000
BIT15 = 100000
BIT2  = 000004
BIT3  = 000010
BIT4  = 000020
BIT5  = 000040
BIT6  = 000100
BIT7  = 000200
BIT8  = 000400
BIT9  = 001000
BPTVEC= 000014
CCCDON  016120
CCC1    015114
CCC10   015510
CCC11   015544
CCC12   015600
CCC13   015634
CCC2    015150
CCC3    015204
CCC4    015240
CCC5    015274
CCC6    015330
CCC7    015364
CCC8    015420
CCC9    015454
CKSWR = 104406
CMPSUB  014216
CMPTMP  014376
CNT   = 000267
CORDON  033142
CORFLG  033124
CORINT  033136
CORMES  037665
CORSUB  032642
CORTMP  033126
CORTRP  033140
CORTV   032740
CORTV0  033102
CORTV1  033106
COR1    032010
COR10   032432
COR11   032476
COR12   032536
COR13   032576
COR2    032034
COR3    032050
COR33   032062
COR4    032122
COR5    032162
COR6    032222
COR7    032266
COR8    032326
COR9    032372
CPSPUR  036712
CPTWO   036730
CR    = 000015
CRLF  = 000200
DDDDON  017054
DDD1    016124
DDD2    016200
DDD3    016254
DDD4    016330
DDD5    016404
DDD6    016460
DDD7    016534
DDISP = 177570
DF1     070056
DF10  = 070056
DF100 = 070277
DF101 = 070277
DF102 = 070277
DF103 = 070277
DF104 = 070277
DF105 = 070277
DF106 = 070277
DF107 = 070277
DF11  = 070056
DF110 = 070277
DF111 = 070125
DF112 = 070125
DF113 = 070125
DF114 = 070125
DF115   070175
DF116 = 070175
DF117 = 070175
DF12  = 070056
DF120 = 070175
DF121 = 070175
DF122 = 070175
DF123 = 070151
DF124 = 070151
DF125 = 070151
DF126 = 070151
DF127   070221
DF13  = 070056
DF130 = 070221
DF131 = 070221
DF132 = 070151
DF133 = 070221
DF134 = 070221
DF135 = 070151
DF136 = 070221
DF137 = 070175
DF14  = 070056
DF140 = 070175
DF141 = 070175
DF142 = 070175
DF143 = 070175
DF144 = 070175
DF145 = 070125
DF146 = 070125
DF147 = 070125
DF15  = 070056
DF150 = 070125
DF151 = 070221
DF152 = 070221
DF153 = 070221
DF154 = 070221
DF155 = 070221
DF156 = 070221
DF157 = 070151
DF16  = 070056
DF160 = 070221
DF161 - 070151
DF162 = 070151
DF163 = 070221
DF164 = 070151
DF165   070331
DF166 = 070331
DF167 = 070331
DF17    070106
DF170 = 070331
DF171 = 070331
DF172 = 070331
DF173 = 070331
DF174 = 070331
DF175 = 070331
DF176   070363
DF177 = 070363
DF2     070074
DF20    070115
DF200 = 070363
DF201 = 070363
DF202 = 070363
DF203 = 070363
DF204 = 070363
DF205 = 070363
DF206 = 070363
DF207   070425
DF21  = 070115
DF210   07( 15
DF211 = 07(425
DF212   070451
DF213 = 070451
DF214 = 070451
DF215 = 070451
DF216 = 070425
DF217   070501
DF22  = 070115
DF220 = 070425
DF221 = 070425
DF222 = 070425
DF223 = 070425
DF224 = 070425
DF225 = 070425
DF226 = 070451
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LLL2    023346  OVDNTT  022404  SW4   = 000020  $CPUOP  001344  $MADR2  001354
LLL3    023432  OVDTT   024210  SW5   = 000040  $CRLF   001313  $MADR3  001360
LIL4    023516  OVFNTT  021444  SW6   = 000100  $DDW0   001402  $MADR4  001364
LOOP    005020  OVFTT   023246  SW7   = 000200  $DDW1   001404  $MAIL   001316
LPERR = 104413  OVUNDN  022004  SW8   = 000400  $DDW10  001426  $MAMS1  001346
MMMDON  030732  OVUNDT  023606  SW9   = 001000  $DDW11  001430  $MAMS2  001352
MMM1    030010  OVUNFN  021044  TAB   = 000011  $DDW12  001432  $MAMS3  001356
MMM2    030062  OVUNFT  022644  TBITVE= 000014  $DDW13  001434  $MAMS4  001362
MMM3    030134  PIRQ  = 177772  TKVEC = 000060  $DDW14  001436  $MBADR  004324
MMM4    030206  PIRQVE= 000240  TPVEC = 000064  $DDW15  001440  $MFLG   035272
MMM5    030260  POWERM  037150  TRAPVE= 000034  $DDW2   001406  $MNEW   035723
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MODDT0  027764  PR4   = 000200  TST13   021456  $DDW8   001422  $MTYP2  001353
MODDT1  027774  PR5   = 000240  TST14   022416  $DDW9   001424  $MTYP3  001357
MODFD0  030712  PR6   = 000300  TST15   023260  $DEVCT  001326  $MTYP4  001363
MODFD1  030722  PR7   = 000340  TST16   024222  $DEVM   001374  $MXCNT  033714
MODFOV  030336  PS    = 177776  TST17   025700  $DOAGN  033366  $NULL   001154
MODFSU  025310  PSW   = 177776  TST2    006744  $ENDAD  033356  $NWTST= 000001
MODFT0  025646  PWRVEC= 000024  TST20   030006  $ENDCT  033200  $OCNT   035024
MODFT1  025656  RDCHR = 104407  TST21   030734  $ENULL  033432  $OMODE  035026
MODP1   025666  RESREG= 104411  TST22   031762  $ENV    001336  $OVER   033700
MSA1    037024  RESVEC= 000010  TST23   033144  $ENVM   001337  $PASS   001324
MSA2    037042  RSETUP= 104412  TST3    011662  $EOP    033144  $PASTM  004330
MSA3    037065  R6    =%000006  TST4    013402  $EOPCT  033172  $PWRAD  036160
MSA4    037077  R7    =%000007  TST5    014410  $ERFLG  001103  $PWRDN  036020
MSA5    037115  SAVREG= 104410  TST6    015112  $ERMAX  001115  $PWRMG  036154
MSA6    037130  SCOPE = 000004  TST7    016122  $ERROR  033716  $PWRUP  036072
MS1     037222  SPACE   037217  TYPE  = 104401  $ERRPC  001116  $QUES   001312
MS10    037421  STACK = 001100  TYPOC = 104402  $ERRTB  001442  $RDCHR  035560
MS11    037443  START   004336  TYPON = 104404  $ERTTL  001112  $RDSZ = 000001
MS12    037467  STKLMT= 177774  TYPOS = 104403  $ESCAP  001304  $REGAD  001160
MS2     037240  SWR     001140  $APTHD  004322  $ETABL  001336  $REG0   001162
MS3     037260  SWREG   000176  $ATYC   035054  $ETEND  001442  $REG1   001164
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$REG10  001202          $RESRE  034212          $TESTN  001322          $TMP22  001276          $TYPE   034250
$REG11  001204          $RTNAD  033426          $TIMES  001302          $TMP23  001300          $TYPEC  034462
$REG12  001206          $RTRN   033422          $TKB    001146          $TMP3   001240          $TYPEX  034600
$REG13  001210          $SAVRE  034154          $TKS    001144          $TMP4   001242          $TYPOC  034626
$REG14  001212          $SAVR6  036202          $TMP0   001232          $TMP5   001244          $TYPON  034642
$REG15  001214          $SCOPE  033436          $TMP1   001234          $TMP6   001246          $TYPOS  034602
$REG16  001216          $SETUP= 000137          $TMP10  001252          $TMP7   001250          $UNIT   001330
$REG17  001220          $STUP = 177777          $TMP11  001254          $TN    = 000023         $UNITM  004332
$REG2   001166          $SVLAD  033644          $TMP12  001256          $TPB    001152          $USWR   001342
$REG20  001222          $SVPC = 004322          $TMP13  001260          $TPFLG  001157          $VECT1  001366
$REG21  001224          $SWR  = 177400          $TMP14  001262          $TPS    001150          $VECT2  001370
$REG22  001226          $SWREG  001340          $TMP15  001264          $TRAP   035734          $XTSTR  033450
$REG23  001230          $SWRMK= 000000          $TMP16  001266          $TRAP2  035756          $$GET4= 000001
$REG3   001170          $SWRMS= 000200          $TMP17  001270          $TRP   = 000014         $OFILL  035025
$REG4   001172          $TAB    037215          $TMP2   001236          $TRPAD  035770          .IPER   036746
$REG5   001174          $TBIT   033430          $TMP20  001272          $TSTM   004326          .RSET   036754
$REG6   001176          $TERM = 00003C          $TMP21  001274          $TSTNM  001102          .$X   - 004322
$REG7   001200

. ABS.  071710      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  58376 WORDS  ( 229 PAGES)
DYNAMIC MEMORY:  20434 WORDS  ( 78 PAGES)
ELAPSED TIME:  00:15:56
CKFPBA0.BIN,CKFPBA0.SEQ/CRF CKFPBA0.MLB/ML,CKFPBA0.P11
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CKFPBA0 CREATED BY MACRO ON 18-SEP-79 AT 13:50 PAGE 1
SYMBOL CROSS REFERENCE CREF SEQ 0172

SYMBOL	VALUE	REFERENCES
AAADON	014406	12-2020 #12-2106
AAA1	013404	#11-1821
AAA10	014022	#11-1952
AAA11	014060	#12-1970
AAA12	014116	#12-1987
AAA13	014154	#12-2004
AAA2	013442	#11-1832
AAA3	013500	#11-1845
AAA4	013536	#11-1858
AAA5	013574	#11-1872
AAA6	013632	#11-1885
AAA7	013670	#11-1902
AAA8	013726	#11-1919
AAA9	013764	#11-1936
ABASE	= 000000	8-890 8-890
ACDW1	= 000000	8-890 8-890
ACDW2	= 000000	8-890 8-890
ACPUOP	000000	8-890 8-890
AC0	-%000000	#7-879 *9-928 *9-930 9-933 *9-962 *9-964 9-967 *9-986 *9-988 9-991 *9-1016 *9-1018 9-1021 *9-1038 *9-1040 9-1043 *9-1158 *9-1160 9-1163 *9-1182 *9-1184 9-1187 9-1198 *9-1223 *9-1225 9-1228 *9-1247 *9-1249 9-1252 9-1263 *9-1289 *9-1291 9-1294 *11-1315 *11-1317 11-1320 11-1331 11-1362 11-1388 11-1414 *11-1486 *11-1489 11-1496 *11-1520 *11-1527 11-1537 *11-1568 *11-1583 *11-1586 11-1589 *11-1603 *11-1605 11-1608 *11-1633 *11-1634 *11-1638 11-1643 *11-1664 *11-1668 11-1673 *12-2053 12-2059 12-2087 *12-2129 *12-2132 *12-2152 *12-2154 *12-2174 *12-2179 *12-2452 *12-2459 12-2466 *13-2636 *13-2644 13-2651 *13-2887 *13-2894 13-2901 *13-3034 *13-3042 13-3049 *13-3221 *13-3240 13-3247 14-3319 *14-3473 *14-3492 14-3499 14-3570 *14-3719 *14-3738 14-3754 14-3832 *15-3971 *15-3990 15-4006 15-4084 *15-4373 *15-4382 15-4388 *16-4742 *16-4751 16-4757 *16-4980 *16-4989 16-4996 *16-5199 *16-5208 16-5215 17-5373 *17-5373 *17-5386 *17-5400 *17-5414 *17-5430 *17-5444 *17-5460 *17-5473 *17-5488 *17-5502 *17-5516 *17-5559 17-5585
AC1	%000001	#7-880 *15-4375 15-4390 *16-4744 16-4759 *16-4982 16-4998 *16-5201 16-5217
AC2	=%000002	#7-881
AC3	=%000003	#7-882
AC4	-%000004	#7-883
AC5	=%000005	#7-884
AC6	=%000006	#7-885
AC7	=%000007	#7-886
ADDW0	- 000000	8-890 8-890
ADDW1	= 000000	8-890 8-890
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ADDW11	= 000000	8-890 8-890
ADDW12	= 000000	8-890 8-890
ADDW13	= 000000	8-890 8-890
ADDW14	- 000000	8-890 8-890
ADDW15	- 000000	8-890 8-890
ADDW2	- 000000	8-890 8-890
ADDW3	- 000000	8-890 8-890
ADDW4	- 000000	8-890 8-890
ADDW5	000000	8-890 8-890
ADDW6	000000	8-890 8-890

SYMBOL	VALUE	REFERENCES					
ADDW7	= 000000	8-890	8-890				
ADDW8	= 000000	8-890	8-890				
ADDW9	= 000000	8-890	8-890				
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ADEVM	= 000000	8-890	8-890				
AENV	= 000000	8-890	8-890				
AENVM	= 000000	8-890	8-890				
AFATAL	= 000000	8-890	8-890				
AMADR1	= 000000	8-890	8-890				
AMADR2	= 000000	8-890	8-890				
AMADR3	= 000000	8-890	8-890				
AMADR4	= 000000	8-890	8-890				
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AMAMS2	= 000000	8-890	8-890				
AMAMS3	= 000000	8-890	8-890				
AMAMS4	= 000000	8-890	8-890				
AMSGAD	- 000000	8-890	8-890				
AMSGLG	- 000000	8-890	8-890				
AMSGTY	= 000000	8-890	8-890				
AMTYP1	- 000000	8-890	8-890				
AMTYP2	= 000000	8-890	8-890				
AMTYP3	= 000000	8-890	8-890				
AMTYP4	= 000000	8-890	8-890				
APASS	= 000000	8-890	8-890				
APRIOR	= 000000	8-890					
APTCSU	- 000040	17-5651	#17-5655				
APTENV	= 000001	17-5647	17-5651	17-5655	#17-5655		
APTSIZ	= 000200	9-903	#17-5655				
APTSPO	= 000100	17-5651	17-5655	#17-5655			
ASWREG	= 000000	8-890	8-890				
ATESTN	= 000000	8-890	8-890				
AUNIT	000000	8-890	8-890				
AUSWR	- 000000	8-890	8-890				
AVECT1	= 000000	8-890	8-890				
AVECT2	= 000000	8-890	8-890				
BBBDON	015110	12-2203	12-2224	12-2232	12-2240	12-2253	#12-2260
BBBER1	014664	12-2126	#12-2207				
BBBER2	014750	12-2139	12-2161	12-2197	#12-2227		
BBBER3	014776	12-2143	12-2165	12-2201	#12-2235		
BBBER4	015024	12-2182	#12-2244				
BBBP1	015070	12-2128	12-2130	12-2153	12-2177	#12-2255	
BBBP2	015100	12-2151	12-2173	#12-2256			
BBB0	014414	#12-2122					
BBB1	014450	12-2127	#12-2132				
BBB2	014476	#12-2146					
BBB3	014526	12-2150	#12-2154				
BBB4	014554	#12-2168					
BBB5	014612	12-2172	#12-2179	12-2184			
BBB6	014620	12-2176	#12-2184				
BIT0	000001	#7-877					
BIT00	000001	#7-877	7-877				
BIT01	000002	#7-877	7-877				

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SYMBOL   VALUE       REFERENCES
BIT02    = 000004    #7-877     7-877
BIT03    = 000010    #7-877     7-877
BIT04    = 000020    #7-877     7-877
BIT05    = 000040    #7-877     7-877
BIT06    = 000100    #7-877     7-877
BIT07    = 000200    #7-877     7-877
BIT08    = 000400    #7-877     7-877     17-5645
BIT09    = 001000    #7-877     7-877     17-5645   17-5647   17-5647
BIT1     = 000002    #7-877
BIT10    = 002000    #7-877     17-5647
BIT11    = 004000    #7-877     17-5645
BIT12    = 010000    #7-877     17-5643
BIT13    = 020000    #7-877     17-5647
BIT14    - 040000    #7-877     17-5645
BIT15    = 100000    #7-877
BIT2     = 000004    #7-877
BIT3     = 000010    #7-877
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BIT5     = 000040    #7-877
BIT6     = 000100    #7-877
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BIT8     - 000400    #7-877
BIT9     = 001000    #7-877
BPTVEC   = 000014    #7-877
CCCDON     016120     12-2420  #12-2507
CCC1       015114    #12-2274
CCC10      015510    #12-2376
CCC11      015544    #12-2387
CCC12      015600    #12-2399
CCC13      015634    #12-2410
CCC2       015150    #12-2285
CCC3       015204    #12-2296
CCC4       015240    #12-2308
CCC5       015274    #12-2319
CCC6       015330    #12-2330
CCC7       015364    #12-2341
CCC8       015420    #12-2353
CCC9       015454    #12-2365
CKSWR    - 104406     17-5645   17-5647   17-5647  #17-5659   17-5886
CMPSUB     014216     11-1822   11-1833   11-1846   11-1859   11-1873   11-1886   11-1903   11-1920   11-1937
                      11-1953   12-1971   12-1988   12-2005  #12-2046
CMPTMP     014376     12-2086   12-2098  #12-2102
CNT        000267    #9-892     9-896     9-896    #9-896     9-896     9-896    #9-896     9-896     9-896
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SYMBOL	VALUE	REFERENCES								
CORFLG	033124	17-5375	17-5388	17-5402	17-5416	17-5432	17-5446	17-5461	17-5474	17-5490
		17-5504	17-5518	17-5553	*17-5569	17-5576	17-5615	#17-5620		
CORINT	033136	17-5353	17-5571	17-5578	#17-5623					
CORMES	037665	17-5366	#18-5933							
CORSUB	032642	17-5369	17-5382	17-5396	17-5410	17-5426	17-5440	17-5456	17-5469	17-5484
		17-5498	17-5512	#17-5553						
CORTMP	033126	17-5584	17-5586	17-5603	#17-5621					
CORTRP	033140	17-5568	#17-5628							
CORTV	032740	17-5568	#17-5576							
CORTV0	033102	17-5598	17-5601	17-5606	#17-5610					
CORTV1	033106	17-5577	#17-5612							
COR1	032010	17-5346	#17-5352							
COR10	032432	#17-5468								
COR11	032476	#17-5483								
COR12	032536	#17-5497								
COR13	032576	#17-5511								
COR2	032034	17-5352	#17-5357							
COR3	032050	17-5349	17-5355	#17-5362						
COR33	032062	17-5364	#17-5367							
COR4	032122	#17-5381								
COR5	032162	#17-5395								
COR6	032222	#17-5409								
COR7	032266	#17-5425								
COR8	032326	#17-5439								
COR9	032372	#17-5455								
CPSPUR	036712	11-1572	11-1584	11-1737	17-5354	17-5358	#17-5847	17-5891		
CPTWO	036730	#17-5858	17-5892							
CR	000015	#7-877	17-5651	17-5651						
CRLF	000200	#7-875	#7-877	9-904	9-904	17-5651	17-5651	18-5913	18-5913	18-5933
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		18-5958	18-5960	18-5962	18-5964	18-5991	18-5993	18-6000	18-6002	18-6003
		18-6005	18-6006	18-6008	18-6010	18-6017	18-6019	18-6020	18-6022	18-6024
		18-6028	18-6030	18-6050	18-6052	18-6064	18-6066	18-6071	18-6073	18-6080
		18-6082	18-6102	18-6104	18-6114	18-6116	18-6121	18-6123	18-6135	18-6137
		18-6139	18-6141	18-6143	18-6144	18-6146	18-6147	18-6149	18-6151	18-6153
		18-6155	18-6167	18-6169	18-6171	18-6173	18-6175	18-6177	18-6179	18-6180
		18-6182	18-6183	18-6185	18-6187	18-6188	18-6190	18-6192	18-6194	18-6217
		18-6221	18-6223	18-6225	18-6233	18-6235	18-6237	18-6239	18-6241	18-6243
		18-6341	18-6341	18-6367	18-6367	18-6367	18-6368	18-6368	18-6368	18-6369
		18-6369	18-6369	18-6370	18-6370	18-6370	18-6372	18-6372	18-6375	18-6375
		18-6376	18-6376	18-6376	18-6376	18-6377	18-6377	18-6378	18-6378	18-6378
		18-6378	18-6379	18-6379	18-6380	18-6380	18-6380	18-6380	18-6381	18-6381
		18-6382	18-6382	18-6383	18-6383	18-6384	18-6384	18-6416	18-6419	18-6421
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DDD6	016460	#12-2577								
DDD7	016534	#12-2589								

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DF10   = 070056         9-896     #19-6670
DF100  = 070277         9-896     #19-6771
DF101  = 070277         9-896     #19-6772
DF102  = 070277         9-896     #19-6773
DF103  = 070277         9-896     #19-6774
DF104  = 070277         9-896     #19-6775
DF105  = 070277         9-896     #19-6776
DF106  = 070277         9-896     #19-6777
DF107  = 070277         9-896     #19-6778
DF11   = 070056         9-896     #19-6671
DF110  - 070277         9-896     #19-6779
DF111  = 070125         9-896     #19-6706
DF112  = 070125         9-896     #19-6707
DF113  - 070125         9-896     #19-6708
DF114  - 070125         9-896     #19-6709
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DF116  - 070175         9-896     #19-6711
DF117  = 070175         9-896     #19-6712
DF12   = 070056         9-896     #19-6672
DF120  - 070175         9-896     #19-6713
DF121  = 070175         9-896     #19-6714
DF122  = 070175         9-896     #19-6715
DF123  = 070151         9-896     #19-6716
DF124  = 070151         9-896     #19-6717
DF125  = 070151         9-896     #19-6718
DF126  = 070151         9-896     #19-6719
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DF13     070056         9-896     #19-6673
DF130  = 070221         9-896     #19-6721
DF131  = 070221         9-896     #19-6722
DF132  = 070151         9-896     #19-6723
DF133  = 070221         9-896     #19-6724
DF134  = 070221         9-896     #19-6725
DF135  - 070151         9-896     #19-6726
DF136  = 070221         9-896     #19-6727
DF137  = 070175         9-896     #19-6728
DF14   = 070056         9-896     #19-6674
DF140  - 070175         9-896     #19-6729
DF141  = 070175         9-896     #19-6730
DF142    070175         9-896     #19-6731
DF143  - 070175         9-896     #19-6732
DF144  = 070175         9-896     #19-6733
DF145  = 070125         9-896     #19-6734
DF146  = 070125         9-896     #19-6735
DF147  = 070125         9-896     #19-6736
DF15   - 070056         9-896     #19-6675
DF150  = 070125         9-896     #19-6737
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DF156	=	070221	9-896	#19-6743						
DF157	=	070151	9-896	#19-6744						
DF16	=	070056	9-896	#19-6676						
DF160	=	070221	9-896	#19-6745						
DF161	=	070151	9-896	#19-6746						
DF162	=	070151	9-896	#19-6747						
DF163	=	070221	9-896	#19-6748						
DF164	=	070151	9-896	#19-6749						
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DF167	=	070331	9-896	#19-6782						
DF17		070106	9-896	#19-6677						
DF170	=	070331	9-896	#19-6783						
DF171	=	070331	9-896	#19-6784						
DF172	=	070331	9-896	#19-6785						
DF173	=	070331	9-896	#19-6786						
DF174	=	070331	9-896	#19-6787						
DF175		070331	9-896	#19-6788						
DF176		070363	9-896	#19-6789	19-6790	19-6791	19-6792	19-6793	19-6794	19-6795	19-6796
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DF177	=	070363	9-896	#19-6790						
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DF20		070115	9-896	#19-6678	19-6679	19-6680					
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DF202	=	070363	9-896	#19-6793						
DF203	=	070363	9-896	#19-6794						
DF204	=	070363	9-896	#19-6795						
DF205	=	070363	9-896	#19-6796						
DF206	=	070363	9-896	#19-6797						
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DF214		070451	9-896	#19-6803						
DF215	=	070451	9-896	#19-6804						
DF216	=	070425	9-896	#19-6805						
DF217		070501	9-896	#19-6806						
DF22	=	070115	9-896	#19-6680						
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DF221	=	070425	9-896	#19-6808						
DF222	=	070425	9-896	#19-6809						

SYMBOL	VALUE	REFERENCES							
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DF225	= 070425	9-896	#19-6812						
DF226	= 070451	9-896	#19-6813						
DF227	= 070451	9-896	#19-6814						
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DF232	= 070451	9-896	#19-6817						
DF233	070510	9-896	#19-6818	19-6825	19-6827	19-6828	19-6829		
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DF237	= 070525	9-896	#19-6823						
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DF244	= 070510	9-896	#19-6828						
DF245	= 070510	9-896	#19-6829						
DF246	- 070151	9-896	#19-6700						
DF247	070540	9-896	#19-6830	19-6831	19-6832				
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DF251	= 070540	9-896	#19-6832						
DF252	070546	9-896	#19-6834	19-6846					
DF253	070552	9-896	#19-6835	19-6836	19-6837	19-6838	19-6839	19-6840	19-6841	19-6842
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DF254	- 070552	9-896	#19-6836						
DF255	- 070552	9-896	#19-6837						
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DF257	= 070552	9-896	#19-6839						
DF26	= 070125	9-896	#19-6685						
DF260	= 070552	9-896	#19-6840						
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DF262	= 070552	9-896	#19-6842						
DF263	= 070552	9-896	#19-6843						
DF264	= 070552	9-896	#19-6844						
DF265	= 070552	9-896	#19-6845						
DF266	= 070546	9-896	#19-6846						
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DF30	= 070125	9-896	#19-6687						
DF31	= 070125	9-896	#19-6688						
DF32	= 070125	9-896	#19-6683						
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DF47	= 070151	9-896	#19-6702						
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DF52	= 070151	9-896	#19-6705						
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DF56	= 070245	9-896	#19-6753						
DF57	= 070245	9-896	#19-6754						
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DF62	= 070245	9-896	#19-6757						
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DF64	= 070245	9-896	#19-6759						
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DF66	= 070245	9-896	#19-6761						
DF67	= 070245	9-896	#19-6762						
DF7	= 070056	9-896	#19-6669						
DF70	070277	9-896	#19-6763	19-6764	19-6765	19-6766	19-6767	19-6768	19-6769	19-6770
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DF77	= 070277	9-896	#19-6770						
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DH107	= 066262	9-896	#19-6574							
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DH110	= 066262	9-896	#19-6575							
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DH112	= 066262	9-896	#18-6501							
DH113	= 066262	9-896	#18-6502							
DH114	066262	9-896	#18-6503							
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DH120	= 066623	9-896	#18-6508							
DH121	= 066623	9-896	#18-6509							
DH122	= 066623	9-896	#18-6510							
DH123	= 066262	9-896	#18-6511							
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DH125	= 066262	9-896	#18-6513							
DH126	= 066262	9-896	#18-6514							
DH127	= 066623	9-896	#18-6515							
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DH131	= 066623	9-896	#18-6517							
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DH177	= 066623	9-896	#19-6586				
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DH213	= 066762	9-896	#19-6600				
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DH215	= 066762	9-896	#19-6602				
DH216	= 067052	9-896	#19-6603				
DH217	067113	9-896	#19-6604				
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DH234		067405	9-896	#19-6622	19-6632			
DH235		067473	9-896	#19-6625				
DH236		067533	9-896	#19-6628				
DH237	=	067405	9-896	#19-6632				
DH24	=	066262	9-896	#18-6477				
DH240		067621	9-896	#19-6634	19-6639			
DH241	=	067344	9-896	#19-6638				
DH242	=	067621	9-896	#19-6639				
DH243	=	067344	9-896	#19-6640				
DH244	=	067344	9-896	#19-6641				
DH245	=	067344	9-896	#19-6642				
DH246	=	066262	9-896	#18-6494				
DH247		067711	9-896	#19-6643				
DH25	=	066262	9-896	#18-6478				
DH250		067756	9-896	#19-6644	19-6645			
DH251	=	067756	9-896	#19-6645				
DH252	=	066352	9-896	#19-6647				
DH253	=	066262	9-896	#19-6648				
DH254	-	066262	9-896	#19-5649				
DH255	=	066262	9-896	#19-6650				
DH256	=	066262	9-896	#19-6651				
DH257	=	066262	9-896	#19-6652				
DH26	=	066262	9-896	#18-6479				
DH260	=	066262	9-896	#19-6653				
DH261	=	066262	9-896	#19-6654				
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DH264	=	066262	9-896	#19-6657				
DH265	=	066262	9-896	#19-6658				
DH266		070016	9-896	#19-6659				
DH27	=	066262	9-896	#18-6480				
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DH30	=	066262	9-896	#18-6481				
DH31	-	066262	9-896	#18-6482				
DH32	=	066262	9-896	#18-6476				
DH33	=	066262	9-896	#18-6483				
DH34	-	066262	9-896	#18-6484				
DH35	=	066262	9-896	#18-6485				
DH36	=	066262	9-896	#18-6486				
DH37	=	066262	9-896	#18-6487				
DH4	=	066262	9-896	#18-6459				
DH40	-	066262	9-896	#18-6488				
DH41	=	066262	9-896	#18-6489				
DH42	-	066262	9-896	#18-6490				
DH43	-	066262	9-896	#18-6491				
DH44		066262	9-896	#18-6492				
DH45	-	066262	9-896	#18-6493				

SYMBOL	VALUE	REFERENCES								
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DH50	= 066262	9-896	#18-6497							
DH51	= 066262	9-896	#18-6498							
DH52	= 066262	9-896	#18-6499							
DH53	= 066262	9-896	#18-6545							
DH54	= 066262	9-896	#18-6546							
DH55	= 066262	9-896	#18-6547							
DH56	= 066262	9-896	#18-6548							
DH57	= 066262	9-896	#18-6549							
DH6	= 066262	9-896	#18-6461							
DH60	= 066262	9-896	#18-6550							
DH61	= 066262	9-896	#18-6551							
DH62	= 066262	9-896	#18-6552							
DH63	= 066262	9-896	#18-6553							
DH64	= 066262	9-896	#18-6554							
DH65	= 066262	9-896	#18-6555							
DH66	= 066262	9-896	#18-6556							
DH67	= 066262	9-896	#18-6557							
DH7	= 066262	9-896	#18-6462							
DH70	= 066262	9-896	#18-6558							
DH71	= 066262	9-896	#18-6559							
DH72	= 066262	9-896	#18-6560							
DH73	= 066262	9-896	#18-6561							
DH74	= 066262	9-896	#18-6562							
DH75	= 066262	9-896	#19-6564							
DH76	= 066262	9-896	#19-6565							
DH77	= 066262	9-896	#19-6566							
DISPLA	001142	#8-890	*9-903	*9-903	17-5645	17-5647				
DISPRE	000174	#7-889	9-903							
DIVDSU	016614	12-2521	12-2532	12-2543	12-2554	12-2565	12-2578	12-2590	#13-2631	
DIVDT	017044	13-2650	13-2659	13-2665	13-2677	#13-2695				
DIVFSU	015674	12-2275	12-2286	12-2297	12-2309	12-2320	12-2331	12-2342	12-2354	12-2366
		12-2377	12-2388	12-2400	12-2411	#12-2448				
DIVFT	016110	12-2465	12-2474	#12-2505						
DSWR	- 177570	#7-877	8-890	9-903						
DT1	070604	9-896	#19-6853	19-6856	19-6857	19-6858	19-6859	19-6860	19-6861	19-6862
		19-6863	19-6864	19-6865	19-6866	19-6867				
DT10	= 070604	9-896	#19-6861							
DT100	= 071120	9-896	#19-6968							
DT101	= 071120	9-896	#19-6969							
DT102	= 071120	9-896	#19-6970							
DT103	= 071120	9-896	#19-6971							
DT104	= 071120	9-896	#19-6972							
DT105	= 071120	9-896	#19-6973							
DT106	= 071120	9-896	#19-6974							
DT107	= 071120	9-896	#19-6975							
DT11	= 070604	9-896	#19-6862							
DT110	= 071120	9-896	#19-6976							
DT111	= 070772	9-896	#19-6898							
DT112	= 070772	9-896	#19-6899							

SYMBOL	VALUE	REFERENCES							
DT113	= 070772	9-896	#19-6900						
DT114	= 070772	9-896	#19-6901						
DT115	071044	9-896	#19-6902	19-6905	19-6906	19-6907	19-6908	19-6909	19-6914	19-6915
		19-6916	19-6918	19-6919	19-6921	19-6922	19-6923	19-6924	19-6925	19-6926
		19-6927	19-6932	19-6933	19-6934	19-6935	19-6936	19-6937	19-6939	19-6942
DT116	= 071044	9-896	#19-6905							
DT117	= 071044	9-896	#19-6906							
DT12	= 070604	9-896	#19-6863							
DT120	= 071044	9-896	#19-6907							
DT121	= 071044	9-896	#19-6908							
DT122	= 071044	9-896	#19-6909							
DT123	= 070772	9-896	#19-6910							
DT124	= 070772	9-896	#19-6911							
DT125	= 070772	9-896	#19-6912							
DT126	= 070772	9-896	#19-6913							
DT127	= 071044	9-896	#19-6914							
DT13	= 070604	9-896	#19-6864							
DT130	= 071044	9-896	#19-6915							
DT131	= 071044	9-896	#19-6916							
DT132	= 070772	9-896	#19-6917							
DT133	= 071044	9-896	#19-6918							
DT134	= 071044	9-896	#19-6919							
DT135	= 070772	9-896	#19-6920							
DT136	= 071044	9-896	#19-6921							
DT137	- 071044	9-896	#19-6922							
DT14	070604	9-896	#19-6865							
DT140	= 071044	9-896	#19-6923							
DT141	= 071044	9-896	#19-6924							
DT142	- 071044	9-896	#19-6925							
DT143	071044	9-896	#19-6926							
DT144	- 071044	9-896	#19-6927							
DT145	= 070772	9-896	#19-6928							
DT146	= 070772	9-896	#19-6929							
DT147	= 070772	9-896	#19-6930							
DT15	= 070604	9-896	#19-6866							
DT150	= 070772	9-896	#19-6931							
DT151	071044	9-896	#19-6932							
DT152	= 071044	9-896	#19-6933							
DT153	= 071044	9-896	#19-6934							
DT154	= 071044	9-896	#19-6935							
DT155	= 071044	9-896	#19-6936							
DT156	- 071044	9-896	#19-6937							
DT157	= 070772	9-896	#19-6938							
DT16	= 070604	9-896	#19-6867							
DT160	= 071044	9-896	#19-6939							
DT161	= 070772	9-896	#19-6940							
DT162	= 070772	9-896	#19-6941							
DT163	= 071044	9-896	#19-6942							
DT164	070772	9-896	#19-6943							
DT165	071206	9-896	#19-6977	19-6981	19-6982	19-6983	19-6984	19-6985	19-6986	19-6987
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		19-6997								

SYMBOL	VALUE	REFERENCES							
DT166	= 071206	9-896	#19-6981						
DT167	= 071206	9-896	#19-6982						
DT17	070670	9-896	#19-6868						
DT170	= 071206	9-896	#19-6983						
DT171	= 071206	9-896	#19-6984						
DT172	= 071206	9-896	#19-6985						
DT173	= 071206	9-896	#19-6986						
DT174	= 071206	9-896	#19-6987						
DT175	= 071206	9-896	#19-6988						
DT176	= 071206	9-896	#19-6989						
DT177	= 071206	9-896	#19-6990						
DT2	070642	9-896	#19-6855						
DT20	070710	9-896	#19-6869						
DT200	= 071206	9-896	#19-6991						
DT201	= 071206	9-896	#19-6992						
DT202	= 071206	9-896	#19-6993						
DT203	= 071206	9-896	#19-6994						
DT204	= 071206	9-896	#19-6995						
DT205	= 071206	9-896	#19-6996						
DT206	= 071206	9-896	#19-6997						
DT207	071316	9-896	#19-7001	19-7004	19-7011	19-7013	19-7014	19-7015	19-7016	19-7017
		19-7018	19-7023							
DT21	070732	9-896	#19-6870							
DT210	071274	9-896	#19-6999	19-7022						
DT211	= 071316	9-896	#19-7004							
DT212	071370	9-896	#19-7005	19-7008	19-7009	19-7010	19-7019	19-7020	19-7021	
DT213	= 071370	9-896	#19-7008							
DT214	= 071370	9-896	#19-7009							
DT215	= 071370	9-896	#19-7010							
DT216	- 071316	9-896	#19-7011							
DT217	071452	9-896	#19-7012							
DT22	070754	9-896	#19-6871							
DT220	- 071316	9-896	#19-7013							
DT221	= 071316	9-896	#19-7014							
DT222	= 071316	9-896	#19-7015							
DT223	= 071316	9-896	#19-7016							
DT224	= 071316	9-896	#19-7017							
DT225	= 071316	9-896	#19-7018							
DT226	= 071370	9-896	#19-7019							
DT227	= 071370	9-896	#19-7020							
DT23	070772	9-896	#19-6872	19-6874	19-6875	19-6876	19-6877	19-6878	19-6879	19-6880
		19-6881	19-6882	19-6883	19-6884	19-6885	19-6886	19-6887	19-6888	19-6889
		19-6890	19-6891	19-6892	19-6893	19-6894	19-6895	19-6896	19-6897	19-6898
		19-6899	19-6900	19-6901	19-6910	19-6911	19-6912	19-6913	19-6917	19-6920
		19-6928	19-6929	19-6930	19-6931	19-6938	19-6940	19-6941	19-6943	
DT230	071370	9-896	#19-7021							
DT231	= 071274	9-896	#19-7022							
DT232	- 071316	9-896	#19-7023							
DT233	071472	9-896	#19-7029	19-7040	19-7042	19-7043	19-7044			
DT234	071526	9-896	#19-7033	19-7037	19-7038	19-7039	19-7041			
DT235	071546	9-896	#19-7035							
DT236	- 071526	9-896	#19-7037							

SYMBOL	VALUE	REFERENCES							
DT237	= 071526	9-896	#19-7038						
DT24	= 070772	9-896	#19-6875						
DT240	= 071526	9-896	#19-7039						
DT241	= 071472	9-896	#19-7040						
DT242	= 071526	9-896	#19-7041						
DT243	= 071472	9-896	#19-7042						
DT244	= 071472	9-896	#19-7043						
DT245	= 071472	9-896	#19-7044						
DT246	= 070772	9-896	#19-6892						
DT247	071560	9-896	#19-7045						
DT25	= 070772	9-896	#19-6876						
DT250	071576	9-896	#19-7046	19-7047					
DT251	= 071576	9-896	#19-7047						
DT252	071610	9-896	#19-7049	19-7066					
DT253	071622	9-896	#19-7051	19-7055	19-7056	19-7057	19-7058	19-7059	19-7060	19-7061
		19-7062	19-7063	19-7064						
DT254	= 071622	9-896	#19-7055						
DT255	= 071622	9-896	#19-7056						
DT256	= 071622	9-896	#19-7057						
DT257	- 071622	9-896	#19-7058						
DT26	= 070772	9-896	#19-6877						
DT260	- 071622	9-896	#19-7059						
DT261	= 071622	9-896	#19-7060						
DT262	071622	9-896	#19-7061						
DT263	- 071622	9-896	#19-7062						
DT264	- 071622	9-896	#19-7063						
DT265	- 071622	9-896	#19-7064						
DT266	- 071610	9-896	#19-7066						
DT27	= 070772	9-896	#19-6878						
DT3	070604	9-896	#19-6856						
DT30	- 070772	9-896	#19-6879						
DT31	070772	9-896	#19-6880						
DT32	- 070772	9-896	#19-6874						
DT33	= 070772	9-896	#19-6881						
DT34	070772	9-896	#19-6882						
DT35	070772	9-896	#19-6883						
DT36	- 070772	9-896	#19-6884						
DT37	- 070772	9-896	#19-6885						
DT4	- 070604	9-896	#19-6857						
DT40	- 070772	9-896	#19-6886						
DT41	- 070772	9-896	#19-6887						
DT42	- 070772	9-896	#19-6888						
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DT45	- 070772	9-896	#19-6891						
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DT47	- 070772	9-896	#19-6894						
DT5	070604	9-896	#19-6858						
DT50	070772	9-896	#19-6895						
DT51	- 070772	9-896	#19-6896						
DT52	- 070772	9-896	#19-6897						
DT53	071120	9-896	#19-6944	19-6948	19-6949	19-6950	19-6951	19-6952	19-6953	19-6954

SYMBOL	VALUE	REFERENCES								
		19-6955	19-6956	19-6957	19-6958	19-6959	19-6960	19-6961	19-6962	19-6963
		19-6964	19-6965	19-6966	19-6967	19-6968	19-6969	19-6970	19-6971	19-6972
		19-6973	19-6974	19-6975	19-6976					
DT54	= 071120	9-896	#19-6948							
DT55	= 071120	9-896	#19-6949							
DT56	= 071120	9-896	#19-6950							
DT57	= 071120	9-896	#19-6951							
DT6	= 070604	9-896	#19-6859							
DT60	= 071120	9-896	#19-6952							
DT61	= 071120	9-896	#19-6953							
DT62	= 071120	9-896	#19-6954							
DT63	= 071120	9-896	#19-6955							
DT64	= 071120	9-896	#19-6956							
DT65	= 071120	9-896	#19-6957							
DT66	= 071120	9-896	#19-6958							
DT67	= 071120	9-896	#19-6959							
DT7	= 070604	9-896	#19-6860							
DT70	= 071120	9-896	#19-6960							
DT71	= 071120	9-896	#19-6961							
DT72	= 071120	9-896	#19-6962							
DT73	= 071120	9-896	#19-6963							
DT74	= 071120	9-896	#19-6964							
DT75	= 071120	9-896	#19-6965							
DT76	= 071120	9-896	#19-6966							
DT77	= 071120	9-896	#19-6967							
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EEE1	017060	#13-2711								
EEE10	017454	#13-2812								
EEE11	017510	#13-2823								
EEE12	017544	#13-2834								
EEE13	017600	#13-2845								
EEE2	017114	#13-2722								
EEE3	017150	#13-2733								
EEE4	017204	#13-2744								
EEE5	017240	#13-2755								
EEE6	017274	#13-2767								
EEE7	017330	#13-2779								
EEE8	017364	#13-2790								
EEE9	017420	#13-2801								
EMTVEC	- 000030	#7-877	9-903	9-903						
EM1	037724	9-896	#18-5937							
EM10	040543	9-896	#18-5952							
EM100	053701	9-896	#18-6175							
EM101	053764	9-896	#18-6177							
EM102	054160	9-896	#18-6180							
EM103	054354	9-896	#18-6183							
EM104	054466	9-896	#18-6185							
EM105	054633	9-896	#18-6188							
EM106	054742	9-896	#18-6190							
EM107	055051	9-896	#18-6192							
EM11	040650	9-896	#18-5954							
EM110	055160	9-896	#18-6194							

SYMBOL	VALUE	REFERENCES		
EM111	043775	9-896	#18-6026	18-6078
EM112	044052	9-896	#18-6027	18-6079
EM113	044130	9-896	#18-6028	
EM114	044206	9-896	#18-6030	
EM115	044265	9-896	#18-6032	
EM116	044343	9-896	#18-6033	
EM117	044422	9-896	#18-6040	
EM12	040757	9-896	#18-5956	
EM120	044560	9-896	#18-6042	
EM121	044716	9-896	#18-6044	
EM122	045053	9-896	#18-6046	
EM123	045210	9-896	#18-6048	18-6100
EM124	045266	9-896	#18-6049	18-6101
EM125	045345	9-896	#18-6050	
EM126	045423	9-896	#18-6052	
EM127	045502	9-896	#18-6054	
EM13	041066	9-896	#18-5958	
EM130	045560	9-896	#18-6055	
EM131	045637	9-896	#18-6062	
EM132	045775	9-896	#18-6064	
EM133	046133	9-896	#18-6067	
EM134	046271	9-896	#18-6069	
EM135	046426	9-896	#18-6071	
EM136	046563	9-896	#18-6074	
EM137	046720	9-896	#18-6076	
EM14	041202	9-896	#18-5960	
EM140	047006	9-896	#18-6077	
EM141	= 043775	9-896	#18-6078	
EM142	- 044052	9-896	#18-6079	
EM143	047075	9-896	#18-6080	
EM144	047153	9-896	#18-6082	
EM145	047232	9-896	#18-6090	
EM146	047377	9-896	#18-6092	
EM147	047544	9-896	#18-6094	
EM15	041314	9-896	#18-5962	
EM150	047710	9-896	#18-6096	
EM151	050054	9-896	#18-6098	
EM152	050142	9-896	#18-6099	
EM153	045210	9-896	#18-6100	
EM154	= 045266	9-896	#18-6101	
EM155	050231	9-896	#18-6102	
EM156	050307	9-896	#18-6104	
EM157	050366	9-896	#18-6112	
EM16	041426	9-896	#18-5964	
EM160	050533	9-896	#18-6114	
EM161	050671	9-896	#18-6117	
EM162	051036	9-896	#18-6119	
EM163	051202	9-896	#18-6121	
EM164	051337	9-896	#18-6124	
EM165	055270	9-896	#18-6208	
EM166	055354	9-896	#18-6210	
EM167	055437	9-896	#18-6212	

SYMBOL		VALUE	REFERENCES		
EM17		041523	9-896	#18-5966	
EM170		055471	9-896	#18-6214	
EM171		055557	9-896	#18-6216	
EM172		055702	9-896	#18-6218	
EM173		055767	9-896	#18-6220	
EM174		056135	9-896	#18-6222	
EM175		056303	9-896	#18-6224	
EM176		056415	9-896	#18-6226	
EM177		056501	9-896	#18-6228	
EM2		037756	9-896	#18-5938	
EM20		041600	9-896	#18-5967	
EM200		056564	9-896	#18-6230	
EM201		056616	9-896	#18-6232	
EM202		056705	9-896	#18-6234	
EM203		057047	9-896	#18-6236	
EM204		057211	9-896	#18-6238	
EM205		057277	9-896	#18-6240	
EM206		057445	9-896	#18-6242	
EM207		057613	9-896	#18-6338	
EM21		041632	9-896	#18-5968	
EM210		057655	9-896	#18-6339	18-6385
EM211		057717	9-896	#18-6340	
EM212		060063	9-896	#18-6367	
EM213		060247	9-896	#18-6368	
EM214		060433	9-896	#18-6369	
EM215		060617	9-896	#18-6370	
EM216		061003	9-896	#18-6371	
EM217		061165	9-896	#18-6374	
EM22		041664	9-896	#18-5969	
EM220		061227	9-896	#18-6375	
EM221		061457	9-896	#18-6376	
EM222		061723	9-896	#18-6377	
EM223		062154	9-896	#18-6378	
EM224		062421	9-896	#18-6379	
EM225		062652	9-896	#18-6380	
EM226		063117	9-896	#18-6381	
EM227		063252	9-896	#18-6382	
EM23		041745	9-896	#18-5970	
EM230		063405	9-896	#18-6383	
EM231		063541	9-896	#18-6384	
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EM234		063734	9-896	#18-6416	
EM235		064020	9-896	#18-6417	
EM236		064066	9-896	#18-6418	
EM237		064121	9-896	#18-6419	
EM24		042022	9-896	#18-5975	
EM240		064205	9-896	#18-6420	
EM241		064241	9-896	#18-6421	
EM242		064344	9-896	#18-6422	
EM243		064400	9-896	#18-6423	
EM244		064503	9-896	#18-6424	

SYMBOL	VALUE	REFERENCES		
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EM246	043405	9-896	#18-6016	
EM247	064624	9-896	#18-6429	
EM25	042120	9-896	#18-5977	18-5981
EM250	064660	9-896	#18-6430	
EM251	064712	9-896	#18-6431	
EM252	064745	9-896	#18-6433	
EM253	065036	9-896	#18-6439	
EM254	065122	9-896	#18-6440	
EM255	065207	9-896	#18-6441	
EM256	065275	9-896	#18-6442	
EM257	065364	9-896	#18-6443	
EM26	042205	9-896	#18-5979	
EM260	065452	9-896	#18-6444	
EM261	065541	9-896	#18-6445	
EM262	065631	9-896	#18-6446	
EM263	065722	9-896	#18-6447	
EM264	066007	9-896	#18-6448	
EM265	066074	9-896	#18-6449	
EM266	066161	9-896	#18-6451	
EM27	- 042120	9-896	#18-5981	
EM3	040012	9-896	#18-5942	
EM30	042303	9-896	#18-5982	
EM31	042355	9-896	#18-5984	
EM32	041770	9-896	#18-5971	
EM33	042422	9-896	#18-5986	
EM34	042445	9-896	#18-5987	
EM35	042477	9-896	#18-5991	
EM36	042552	9-896	#18-5993	
EM37	042620	9-896	#18-5995	
EM4	040117	9-896	#18-5944	
EM40	042643	9-896	#18-5999	
EM41	042675	9-896	#18-6000	
EM42	042750	9-896	#18-6002	
EM43	043101	9-896	#18-6005	
EM44	043232	9-896	#18-6008	
EM45	043300	9-896	#18-6010	
EM46	043353	9-896	#18-6012	
EM47	043430	9-896	#18-6017	
EM5	040224	9-896	#18-5946	
EM50	043564	9-896	#18-6020	
EM51	043637	9-896	#18-6022	
EM52	043705	9-896	#18-6024	
EM53	051535	9-896	#18-6127	
EM54	051566	9-896	#18-6128	
EM55	051503	9-896	#18-6126	
EM56	051616	9-896	#18-6135	
EM57	051707	9-896	#18-6137	
EM6	040331	9-896	#18-5948	
EM60	051777	9-896	#18-6139	
EM61	052101	9-896	#18-6141	
EM62	052275	9-896	#18-6144	

SYMBOL	VALUE	REFERENCES								
EM63	052471	9-896	#18-6147							
EM64	052602	9-896	#18-6149							
EM65	052721	9-896	#18-6151							
EM66	053034	9-896	#18-6153							
EM67	053103	9-896	#18-6155							
EM7	040436	9-896	#18-5950							
EM70	053166	9-896	#18-6157							
EM71	053217	9-896	#18-6158							
EM72	053247	9-896	#18-6159	18-6160						
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EM74	053301	9-896	#18-6167							
EM75	053410	9-896	#18-6169							
EM76	053501	9-896	#18-6171							
EM77	053571	9-896	#18-6173							
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		12-1966	12-1983	12-2000	12-2017	12-2083	12-2099	12-2222	12-2231	12-2239
		12-2252	12-2282	12-2293	12-2305	12-2316	12-2327	12-2338	12-2349	12-2361
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		17-5860								
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ERT1	036370	#17-5726	17-5813							
ERT2	036624	17-5731	17-5744	17-5764	17-5773	17-5801	#17-5805			
ERT3	036630	17-5781	17-5789	#17-5810						

SYMBOL	VALUE	REFERENCES								
ERT4	036642	17-5722	17-5812	#17-5815						
ERT5	036654	17-5688	#17-5820							
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FFF1	020070	#13-2956								
FFF2	020144	#13-2968								
FFF3	020220	#13-2979								
FFF4	020274	#13-2990								
FPSPUR	036660	9-1014	9-1071	9-1193	9-1258	11-1326	11-1355	11-1381	11-1407	12-2189
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GGDATO	011540	9-1162	9-1186	9-1197	9-1227	9-1251	9-1262	9-1293	11-1319	11-1330
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GGDONE	011660	11-1349	11-1363	11-1365	11-1367	11-1369	11-1373	11-1375	11-1389	11-1391
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		11-1424	11-1426	11-1428	#11-1472					
GGER0	010036	9-1156	#11-1351							
GGER1	010134	9-1168	#11-1365	11-1371						
GGER10	010646	9-1253	#11-1395							
GGER11	010714	9-1268	#11-1397							
GGER12	010762	9-1273	#11-1399							
GGER13	011030	9-1280	#11-1401							
GGER14	011076	9-1287	#11-1403							
GGER15	011174	9-1299	#11-1418							
GGER16	011242	9-1304	#11-1420							
GGER17	011310	11-1321	#11-1422							
GGER18	011356	11-1336	#11-1424							
GGER19	011424	11-1347	#11-1426							
GGER2	010202	9-1173	#11-1367							
GGER20	011472	11-1341	#11-1428							
GGER3	010250	9-1188	#11-1369							
GGER4	010316	9-1203	#11-1371							
GGER5	010320	9-1214	#11-1373							
GGER6	010366	9-1208	#11-1375							
GGER7	010434	9-1221	#11-1377							
GGER8	010532	9-1233	#11-1391							
GGER9	010600	9-1238	#11-1393							
GGGDON	025676	15-4333	#15-4462							
GGG1	024224	#15-4110								
GGG10	024774	#15-4256								
GGG11	025044	#15-4272								
GGG12	025114	#15-4288								
GGG13	025164	#15-4304								
GGG14	025234	#15-4320								
GGG2	024274	#15-4126								
GGG3	024344	#15-4142								
GGG4	024414	#15-4158								
GGG5	024464	#15-4174								
GGG6	024534	#15-4190								
GGG7	024604	#15-4207								

SYMBOL	VALUE	REFERENCES								
GCG8	024654	#15-4224								
GGG9	024724	#15-4240								
GGP1	011550	11-1416	#11-1435							
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GGP3	011570	9-1224	9-1248	11-1389	11-1391	11-1393	11-1395	11-1397	11-1399	11-1401
		11-1416	#11-1443							
GGP4	011600	#11-1447								
GGP5	011610	9-1157	9-1159	9-1181	9-1183	11-1363	11-1363	11-1365	11-1365	11-1367
		11-1367	11-1369	11-1369	11-1373	11-1373	11-1375	11-1375	#11-1451	
GGP6	011620	9-1164	9-1199	9-1229	9-1295	11-1363	11-1365	11-1367	11-1369	11-1373
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GGP7	011630	9-1264	11-1395	11-1397	11-1399	11-1401	#11-1460			
GGP8	011640	9-1290	11-1316	11-1418	11-1420	11-1422	11-1424	11-1426	11-1428	#11-1464
GGP9	011650	11-1332	11-1422	11-1424	11-1426	11-1428	#11-1468			
GG1	006746	#9-1152								
GG10	007242	9-1213	#9-1217							
GG11	007300	9-1220	#9-1225							
GG12	007322	#9-1231	9-1234							
GG13	007332	9-1232	#9-1234							
GG14	007350	9-1237	#9-1241							
GG15	007406	9-1244	#9-1249							
GG16	007424	9-1245	#9-1254							
GG17	007472	#9-1266	9-1269							
GG18	007502	9-1267	#9-1269							
GG19	007536	9-1279	#9-1283							
GG2	007004	9-1155	#9-1160							
GG20	007574	9-1286	#9-1291							
GG21	007616	#9-1297	9-1300							
GG22	007626	9-1298	#9-1300							
GG23	007644	9-1303	#11-1309							
GG24	007702	11-1312	#11-1317							
GG25	007720	11-1313	#11-1322							
GG26	007766	#11-1334	11-1337							
GG27	007776	11-1335	#11-1337							
GG28	010032	11-1346	#11-1349							
GG3	007026	#9-1166	9-1169							
GG4	007036	9-1167	#9-1169							
GG5	007054	9-1172	#9-1176							
GG6	007112	9-1179	#9-1184							
GG7	007130	9-1180	#9-1189							
GG8	007176	#9-1201	9-1204							
GG9	007206	9-1202	#9-1204							
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GTSWR	- 104405	9-904	#17-5659							
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HHDON.	006742	9-1054	9-1055	9-1056	9-1057	9-1058	9-1059	9-1060	9-1061	9-1062
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SYMBOL	VALUE	REFERENCES								
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HHER1	005660	9-945	#9-1056							
HHER10	006454	9-1053	#9-1066							
HHER2	005774	9-972	#9-1058							
HHER3	006042	9-977	#9-1059							
HHER4	006110	9-1001	#9-1060							
HHER5	006156	9-1003	#9-1061							
HHER6	006224	9-1008	#9-1062							
HHER7	006272	9-1026	#9-1063							
HHER8	006340	9-1031	#9-1064							
HHER9	006406	9-1048	#9-1065							
HHHDON	030004	16-4703	#16-4840							
HHH1	025702	#15-4477								
HHH10	027002	#16-4636								
HHH11	027102	#16-4654								
HHH12	027202	#16-4672								
HHH13	027302	#16-4690								
HHH2	026002	#15-4493								
HHH3	026102	#15-4511								
HHH4	026202	#15-4528								
HHH5	026302	#15-4546								
HHH6	026402	#15-4565								
HHH7	026502	#15-4582								
HHH8	026602	#16-4600								
HHH9	026702	#16-4616								
HHP0	006602	9-927	9-1055	9-1056	9-1057	#9-1085				
HHP1	006612	9-929	9-1055	9-1056	9-1057	#9-1089				
HHP10	006722	9-1022	9-1063	9-1064	#9-1125					
HHP11	006732	9-1044	9-1065	9-1066	#9-1129					
HHP2	006622	9-934	9-1055	9-1056	9-1057	#9-1093				
HHP3	006632	9-939	#9-1097							
HHP4	006642	9-968	9-997	9-1058	9-1059	#9-1101				
HHP5	006652	9-961	9-1037	9-1039	9-1058	9-1059	9-1065	9-1065	9-1066	9-1066
		#9-1105								
HHP6	006662	9-963	9-1058	9-1059	#9-1109					
HHP7	006672	9-992	9-1060	9-1061	9-1062	#9-1113				
HHP8	006702	9-985	9-1015	9-1017	9-1060	9-1061	9-1062	9-1063	9-1063	9-1064
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HHTRAP	006522	9-960	#9-1067							
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HH10	005234	9-971	#9-973							
HH11	005252	9-976	#9-980							
HH12	005302	9-984	#9-988							
HH13	005324	#9-994	9-1004							
HH14	005344	#9-999	9-1002							
HH15	005354	9-1000	#9-1002							
HH16	005362	9-995	#9-1004							
HH17	005400	9-1007	#9-1010							
HH18	005436	9-1013	#9-1018							
HH19	005460	#9-1024	9-1027							

SYMBOL	VALUE	REFERENCES								
HH2	005052	9-926	#9-930							
HH20	005470	9-1025	#9-1027							
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HH22	005536	9-1036	#9-1040							
HH23	005560	#9-1046	9-1049							
HH24	005570	9-1047	#9-1049							
HH25	005606	9-1052	#9-1054							
HH3	005074	#9-936	9-946							
HH4	005114	#9-941	9-944							
HH5	005124	9-942	#9-944							
HH6	005132	9-937	#9-946							
HH7	005144	9-948	#9-955							
HH8	005202	9-959	#9-964							
HH9	005224	#9-970	9-973							
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HXDONE	013400	11-1686	11-1693	11-1698	11-1704	11-1710	11-1715	11-1720	11-1725	11-1731
		11-1742	11-1751	11-1760	#11-1806					
HXER1	012656	11-1492	#11-1690							
HXER10	013146	11-1575	#11-1744							
HXER11	013200	11-1620	#11-1753							
HXER12	013220	11-1622	#11-1756							
HXER13	013250	11-1649	11-1679	#11-1762						
HXER2	012716	11-1506	11-1594	#11-1700						
HXER22	012732	#11-1702	11-1755	11-1764						
HXER3	012746	11-1508	#11-1706							
HXER33	012762	#11-1708								
HXER4	012776	11-1655	11-1685	#11-1712						
HXER5	012676	11-1531	#11-1695							
HXER6	013032	11-1548	#11-1721							
HXER66	013046	#11-1723								
HXER7	013062	11-1550	#11-1727							
HXER8	013014	11-1513	11-1557	#11-1717						
HXER9	013112	11-1566	#11-1733							
HXP1	013300	11-1485	11-1519	11-1632	11-1637	11-1645	11-1667	11-1675	11-1762	11-1763
		#11-1771								
HXP2	013310	11-1487	11-1490	11-1501	11-1522	11-1529	11-1585	11-1690	11-1695	11-1700
		11-1706	11-1721	11-1727	#11-1776					
HXP3	013320	#11-1780								
HXP4	013330	11-1604	11-1753	11-1756	#11-1784					
HXP5	013340	11-1610	11-1754	11-1757	#11-1788					
HXP6	013350	11-1582	11-1602	11-1663	#11-1792					
HXP7	013360	11-1497	11-1543	11-1590	11-1615	11-1701	11-1707	#11-1797		
HXP8	013370	11-1538	11-1722	11-1728	#11-1801					
HX1	011664	#11-1482								
HX10	012072	11-1530	#11-1533							
HX11	012114	#11-1540	11-1552							
HX12	012134	#11-1546	11-1549							
HX13	012144	11-1547	#11-1549							
HX14	012152	11-1541	#11-1552							
HX15	012170	11-1556	#11-1561							

SYMBOL		VALUE	REFERENCES		
HX16		012216	11-1565	#11-1568	
HX165		012222	#11-1569	11-1735	11-1746
HX17		012250	11-1574	#11-1577	
HX18		012306	11-1581	#11-1586	
HX19		012326	#11-1592	11-1595	
HX2		011714	11-1488	#11-1489	
HX20		012336	11-1593	#11-1595	
HX21		012340	#11-1598		
HX22		012370	11-1601	#11-1605	
HX23		012410	#11-1612	11-1624	
HX24		012430	#11-1618	11-1621	
HX25		012440	11-1619	#11-1621	
HX26		012446	11-1613	#11-1624	
HX27		012450	#11-1628		
HX28		012502	11-1636	#11-1638	
HX29		012524	#11-1647	11-1650	
HX3		011730	11-1491	#11-1493	
HX30		012534	11-1648	#11-1650	
HX31		012552	11-1654	#11-1659	
HX32		012602	11-1666	#11-1668	
HX33		012624	#11-1677	11-1680	
HX34		012634	11-1678	#11-1680	
HX35		012652	11-1684	#11-1686	
HX4		011750	#11-1499	11-1509	
HX5		011770	#11-1504	11-1507	
HX6		012000	11-1505	#11-1507	
HX7		012006	11-1500	#11-1509	
HX8		012024	11-1512	#11-1515	
HX9		012056	11-1523	#11-1527	
IIIDON		021454	13-3174	#14-3344	
III1		020620	#13-3111		
III2		020664	#13-3127		
III3		020730	#13-3144		
III4		020774	#13-3160		
IOTVEC	=	000020	#7-877	9-903	9-903
JJJDON		022414	14-3428	#14-3595	
JJJ1		021460	#14-3361		
JJJ2		021544	#14-3379		
JJJ3		021630	#14-3396		
JJJ4		021714	#14-3414		
KKKDON		023256	14-3676	#14-3842	
KKK1		022420	#14-3615		
KKK3		022464	#14-3631		
KKK4		022530	#14-3647		
KKK5		022574	#14-3663		
LF	-	000012	#7-877	17-5651	17-5651
LLLDON		024220	14-3927	#15-4094	
LLL1		023262	#14-3858		
LLL2		023346	#14-3876		
LLL3		023432	#14-3894		
LLL4		023516	#14-3912		
LOOP		005020	#9-906	17-5643	

SYMBOL	VALUE	REFERENCES								
LPERR	= 104413	9-923	9-955	9-980	9-1010	9-1033	9-1152	9-1176	9-1217	9-1241
		9-1283	11-1309	11-1482	11-1515	11-1561	11-1577	11-1598	11-1628	11-1659
		11-1821	11-1832	11-1845	11-1858	11-1872	11-1885	11-1902	11-1919	11-1936
		11-1952	12-1970	12-1987	12-2004	12-2121	12-2146	12-2168	12-2274	12-2285
		12-2296	12-2308	12-2319	12-2330	12-2341	12-2353	12-2365	12-2376	12-2387
		12-2399	12-2410	12-2520	12-2531	12-2542	12-2553	12-2564	12-2577	12-2589
		13-2711	13-2722	13-2733	13-2744	13-2755	13-2767	13-2779	13-2790	13-2801
		13-2812	13-2823	13-2834	13-2845	13-2956	13-2968	13-2979	13-2990	13-3111
		13-3127	13-3144	13-3160	14-3361	14-3379	14-3396	14-3414	14-3615	14-3631
		14-3647	14-3663	14-3858	14-3876	14-3894	14-3912	15-4110	15-4126	15-4142
		15-4158	15-4174	15-4190	15-4207	15-4224	15-4240	15-4256	15-4272	15-4288
		15-4304	15-4320	15-4477	15-4493	15-4511	15-4528	15-4546	15-4565	15-4582
		16-4600	16-4616	16-4636	16-4654	16-4672	16-4690	16-4856	16-4873	16-4890
		16-4908	16-4926	16-5087	16-5106	16-5125	16-5144	17-5368	17-5381	17-5395
		17-5409	17-5425	17-5439	17-5455	17-5468	17-5483	17-5497	17-5511	#17-5661
MMMDON	030732	16-4940	#16-5071							
MMM1	030010	#16-4856								
MMM2	030062	#16-4873								
MMM3	030134	#16-4890								
MMM4	030206	#16-4908								
MMM5	030260	#16-4926								
MNUMBE	= 000266	#5-620	9-894							
MODDD0	031740	16-5214	16-5227	16-5234	#17-5295					
MODDD1	031750	16-5216	16-5228	16-5242	17-5266	#17-5297				
MODDOV	031352	16-5088	16-5107	16-5126	16-5145	#16-5195				
MODDSU	027406	15-4478	15-4494	15-4512	15-4529	15-4547	15-4566	15-4583	16-4601	16-4617
		16-4637	16-4655	16-4673	16-4691	#16-4738				
MODDT0	027764	16-4756	16-4769	16-4774	16-4797	#16-4836				
MODDT1	027774	16-4758	16-4770	16-4782	16-4814	#16-4838				
MODFD0	030712	16-4995	16-5008	16-5015	#16-5067					
MODFD1	030722	16-4997	16-5009	16-5021	#16-5069					
MODFOV	030336	16-4857	16-4874	16-4891	16-4909	16-4927	#16-4976			
MODFSU	025310	15-4111	15-4127	15-4143	15-4159	15-4175	15-4191	15-4208	15-4225	15-4241
		15-4257	15-4273	15-4289	15-4305	15-4321	#15-4369			
MODFT0	025646	15-4387	15-4400	15-4405	#15-4456					
MODFT1	025656	15-4389	15-4401	15-4411	#15-4458					
MODP1	025666	15-4374	#15-4460	16-4743	16-4981	16-5200				
MSA1	037024	#17-5904	19-7052							
MSA2	037042	#17-5905	19-7052							
MSA3	037065	#17-5906	19-7053							
MSA4	037077	#18-5908	19-7053							
MSA5	037115	#18-5909	19-7054							
MSA6	037130	#18-5910	19-7054							
MS1	037222	#18-5916	19-6854	19-6872	19-6903	19-6945	19-6978			
MS10	037421	#18-5923	19-6947	19-6980						
MS11	037443	#18-5924	19-6946	19-6979						
MS12	037467	#18-5925	19-6946	19-6979						
MS2	037240	#18-5917	19-6854	19-6872	19-6903	19-6945	19-6978			
MS3	037260	#18-5918	19-6855							
MS37	037512	#18-5926	19-7030							
MS4	037307	#18-5919	19-6855							
MS40	037530	#18-5927	19-7030							

SYMBOL	VALUE	REFERENCES								
MS41	037564	#18-5929	19-7001	19-7006	19-7031					
MS415	037544	#18-5928								
MS42	037610	#18-5930	19-7002	19-7006						
MS43	037626	#18-5931	19-7002	19-7007						
MS44	037643	#18-5932	19-7003	19-7007						
MS5	037335	#18-5920	19-6873	19-6904						
MS6	037357	#18-5921	19-6873	19-6904						
MS7	037375	#18-5922	19-6947	19-6980						
MULDSU	020354	13-2957	13-2969	13-2980	13-2991	#13-3029				
MULDT	020604	13-3048	13-3057	13-3063	13-3075	#13-3093				
MULFSU	017640	13-2712	13-2723	13-2734	13-2745	13-2756	13-2768	13-2780	13-2791	13-2802
		13-2813	13-2824	13-2835	13-2846	#13-2883				
MULFT	020054	13-2900	13-2909	#13-2940						
NNNDON	031760	16-5160	#17-5299							
NNN1	030736	#16-5087								
NNN2	031040	#16-5106								
NNN3	031142	#16-5125								
NNN4	031244	#16-5144								
OVDNTT	022404	14-3482	14-3498	14-3503	14-3529	14-3569	#14-3593			
OVDTT	024210	15-3980	15-4005	15-4010	15-4050	15-4083	#15-4092			
OVFNTT	021444	13-3230	13-3246	13-3251	14-3278	14-3318	#14-3342			
OVFTT	023246	14-3728	14-3753	14-3758	14-3798	14-3831	#14-3840			
OVUNDN	022004	14-3362	14-3380	14-3397	14-3415	#14-3468				
OVUNDT	023606	14-3859	14-3877	14-3895	14-3913	#15-3966				
OVUNFN	021044	13-3112	13-3128	13-3145	13-3161	#13-3216				
OVUNFT	022644	14-3616	14-3632	14-3648	14-3664	#14-3714				
PIRQ	= 177772	#7-877								
PIRQVE	- 000240	#7-877								
POWERM	037150	17-5664	#18-5913							
PROGNU	= 000002	#5-621	9-904							
PR0	- 000000	#7-877								
PR1	= 000040	#7-877								
PR2	000100	#7-877								
PR3	- 000140	#7-877								
PR4	- 000200	#7-877								
PR5	- 000240	#7-877								
PR6	- 000300	#7-877								
PR7	000340	#7-877								
PS	= 177776	#7-877	7-877							
PSW	= 177776	#7-877	17-5567							
PWRVEC	= 000024	#7-877	9-903	9-903	17-5664	17-5664	17-5664	17-5664	17-5664	17-5664
RDCHR	= 104407	#17-5659								
RESREG	= 104411	#17-5659								
RESVEC	= 000010	#7-877	9-903	9-903	9-903					
RSETUP	104412	9-1133	11-1472	11-1806	12-2106	12-2260	12-2507	13-2697	13-2942	13-3095
		14-3344	14-3595	14-3842	15-4094	15-4462	16-4840	16-5071	17-5299	17-5635
		#17-5660	17-5839	17-5850	17-5861					
R6	%000006	#7-877	*9-903	*9-903	9-903					
R7	-%000007	#7-877								
SAVREG	104410	#17-5659								
SCOPE	= 000004	#7-877	9-919	9-1149	11-1480	11-1818	12-2118	12-2271	12-2517	13-2708
		13-2953	13-3108	14-3358	14-3612	14-3855	15-4107	15-4474	16-4853	16-5084

SYMBOL		VALUE	REFERENCES								
			17-5343	17-5643							
SPACE		037217	17-5741	17-5753	17-5757	17-5761	17-5799	#18-5915			
STACK	=	001100	#7-877	9-903	17-5894						
START		004336	7-889	#9-903	17-5664						
STKLMT	=	177774	#7-877								
SWR		001140	#8-890	9-903	*9-903	9-903	*9-903	*9-903	9-904	17-5347	17-5643
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			17-5647	17-5657	17-5657	17-5664	17-5664	17-5883			
SWREG		000176	#7-889	9-903	9-904	17-5657	17-5657				
SW0	-	000001	#7-877								
SW00	=	000001	#7-877	7-877							
SW01	-	000002	#7-877	7-877							
SW02	=	000004	#7-877	7-877							
SW03	=	000010	#7-877	7-877							
SW04	=	000020	#7-877	7-877							
SW05	-	000040	#7-877	7-877							
SW06	=	000100	#7-877	7-877							
SW07		000200	#7-877	7-877							
SW08	=	000400	#7-877	7-877							
SW09	=	001000	#7-877	7-877							
SW1	-	000002	#7-877								
SW10	-	002000	#7-877								
SW11	=	004000	#7-877								
SW12	-	010000	#7-877								
SW13	-	020000	#7-877								
SW14	-	040000	#7-877								
SW15	-	100000	#7-877								
SW2	-	000004	#7-877								
SW3		000010	#7-877								
SW4		000020	#7-877								
SW5		000040	#7-877								
SW6		000100	#7-877								
SW7		000200	#7-877								
SW8	-	000400	#7-877								
SW9		001000	#7-877								
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			18-6472	18-6472	18-6473	18-6474	18-6474	18-6474	18-6504	18-6504	18-6504
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			19-6625	19-6626	19-6628	19-6628	19-6629	19-6630	19-6634	19-6634	19-6635
			19-6636	19-6643	19-6643	19-6643	19-6644	19-6644	19-6659	19-6659	
TBITVE		000014	#7-877	9-903	9-903						
TKVEC		000060	#7-877								
TPVEC	-	000064	#7-877								
TRAPVE	=	000034	#7-877	9-903	9-903						
TRTVEC		000014	#7-877								
TST1		005020	#9-919								
TST10		017056	#13-2708								

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SYMBOL  VALUE          REFERENCES
TST11     020066       #13-2953
TST12     020616       #13-3108
TST13     021456       #14-3358
TST14     022416       #14-3612
TST15     023260       #14-3855
TST16     024222       #15-4107
TST17     025700       #15-4474
TST2      006744       #9-1149
TST20     030006       #16-4853
TST21     030734       #16-5084
TST22     031762       #17-5343
TST23     033144       #17-5639
TST3      011662       #11-1480
TST4      013402       #11-1818
TST5      014410       #12-2118
TST6      015112       #12-2271
TST7      016122       #12-2517
TYPE    = 104401       9-904     17-5365   17-5643   17-5643   17-5643   17-5647   17-5647   17-5651   17-5653
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                       17-5787   17-5798   17-5805   17-5815
TYPOC   - 104402       17-5657   #17-5659  17-5687   17-5730   17-5739   17-5743   17-5751   17-5755   17-5759
                       17-5763   17-5797
TYPON   - 104404       #17-5659
TYPOS   - 104403       17-5643   17-5643   #17-5659  17-5770
$APTHD    004322       9-900     #9-900
$ASTAT  - ******       17-5655   17-5655
$ATYC     035054       17-5655   #17-5655
$ATY1     035030       #17-5655
$ATY3     035036       17-5651   #17-5655
$ATY4     035046       17-5647   #17-5655
$AUTOB    001134       #8-890    *9-904    17-5657   17-5657   17-5657
$BASE     001372       #8-890
$BDADR    001122       #8-890
$BDDAT    001126       #8-890
$BELL     001306       #8-890    17-5647   17-5647   17-5647
$CDW1     001376       #8-890
$CDW2     001400       #8-890
$CHARC    034576       *17-5651  *17-5651  17-5651   *17-5651  #17-5651
$CKSWR    035276       #17-5657  17-5659   17-5659
$CLR.T    033346       17-5643   #17-5643
$CMTAG    001100       #8-890    9-903     9-903     9-903     9-903     9-903     9-903     9-903
$CM1    - 000024       #8-890    8-890     8-890     #8-890    8-890     8-890     #8-890    8-890     8-890
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SYMBOL	VALUE	REFERENCES
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AS4             #18-6313
AS5             #18-6318    18-6338
AS6             #18-6321    18-6339
AS7             #18-6324
COMMEN          #7-877
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DM2             #18-5988    18-5991    18-5993
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ENDPAS          #5-626      17-5643
ERMAC           #5-658      17-5647
ESCAPE          #7-877
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GETSWR          #7-877     #9-904     #9-904
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LD1M2	#18-6254									
LD1M3	#18-6260									
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	#12-2263	#12-2271	#12-2510	#12-2517	#13-2700	#13-2708	#13-2945	#13-2953	#13-3098	#13-3108
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	#16-4844	#16-4853	#16-5075	#16-5084	#17-5301	#17-5343				
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	#17-5850	#17-5861								
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TRMTRP           #17-5659    17-5662
TYPBIN           #7-877
TYPDEC           #7-877
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TYPNUM           #7-877
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