TEST PROGRAM FOR CP1BF, CP2B

TEST OF PAGE FAULT

TEST OF AUTOMATIC RESTART

PAF2B

Procedure 12NC : 5111 991 13101

Concerned PV :
PV250-165 (tape)
PV350-165 (cassette)
PV450-165 (floppy)

PAF2B includes :

Procedure	
+ Listing	12NC : 5111 991 13111
+ Program	12NC : 5111 199 56961

0. **TABLE OF CONTENTS**

1. **GENERAL**

2. **MINIMUM CONFIGURATION REQUIRED**

3. **LOADING PROCEDURE**

4. **PROGRAM RUNNING**

4.1. Program Execution
4.2. Error Indication
4.3. Interference Interrupt
4.4. Power Failure and Counter
4.5. Number of Program Execution and Counter

5. **PROGRAM ORGANISATION**

5.1. Meaning of A6 after a halt error
5.2. Physical block location according to A6 right

1. GENERAL

The test program PAF2B is used as a complementary test of CP1/2B and MMU2B.

The intention of this program is to control the correct processing of a page fault trap, and the correct resuming of the instruction which caused the page fault.

In addition, it is able to check the correct handling of real time clock interrupt as well as the Power failure interrupt.

2. MINIMUM CONFIGURATION REQUIRED

- CPU boards,

- An input peripheral to load the program (Tape, Cassette, Floppy or disc test resident).

A minimum of 32K memory words is required.

3. LOADING PROCEDURE

Using the following procedure load the test program into the system :

- Load the test program media in the appropriate input peripheral,
- Using the operator's panel select the appropriate values to load the program from the peripheral using IPL routine,
- Press the MC button,
- Press the IPL button.

When the loading is complete, the program will stop at hexadecimal address /400 so that program initialization can be performed by the operator.

4. PROGRAM RUNNING

4.1. Program Execution

- After loading, the program stops at address /400 (hexadecimal)

- Select in A10 register
  bit 15 = 0 if a FPP is not present in the system (Standard Initialization)

  bit 15 = 1 if a FPP is present in the system.
  (if a FPP is present in the system and if A10 remains 0, the page fault detection on FPP instruction will not be executed).

- If you want to make PWF/AR during test execution, switch to "LOCK" position.

- Depress RUN.

The program will then continue till the operator stops it. The program stops only if an error occurs.

The execution of one run of the complete program is about 1 second.

4.2. Error indication

When an error occurs during execution, the program stops on a HLT.

During all the following halts A6 Right byte refers to the instruction block causing the error. If A6 left byte is not zero, it indicates that the concerned block checks more than an instruction in page fault condition.

See meaning of A6 in chapter 5.

HALT ADDRESS	MEANING
266	PSW of the trapped program is not correct A2 = LP of the trapped program A3 = received PSW (except RUN and CR). Should be FC41 A4 = P' of the trapped instruction
278	The expected P' of the trapped program not correct A2 = LP of the trapped program A4 = received P' A7 = expected P'
280	This instruction has already been trapped once A2 = LP A3 = PSW A4 = P'
286	The expected LP of the trapped instruction is not correct A2 = received LP A4 = P' A7 = expected LP
2B2	The PSW of the trapped program is detected in ENB or extended system mode A2 = LP A3 = received PSW A4 = P' received
2BC	Trap at address /7E. Read into A15 stack to get address of the trapped instruction
2D2	Programs is stopped on waiting for Power off. Your automatic restart process does not work proprely.
31A	A false interrupt has been received, depress RST to get the status. If status 63, it is probably due to a trap in /7C (trap of D format),if so read A15 stock to get address of the trapped instruction.
35A	The expected PAF has not been executed. A6 right = Block of test A6 left = Pointer in instruction table
3BE	The resuming of an instruction after a PAF has not been done proprely. A6 right = Block of test A6 left = Pointer in instruction table

4.3. Interference interrupt

All interference interrupts will stop the program at address 31A. See chapter 4.2.

4.4. Power failure and counter

The program is protected against power failure and can be used to check the correct processing of a power failure and automatic restart.

A counter located at address /2B6 gives the number of automatic restarts. After a power failure the program can be restarted (if the program is always in) from /3EA.

4.5. Number of program executions and counter

Due to the complexity of the program it is necessary to control the RUN counter to be sure that the test program is working proprely (normal incrementation of the counter 1 run is about 1 second).

5. PROGRAM ORGANISATION

The program is split up in 3 parts .

- Main part controlling the user program
- The user program
- The blocks generating the page faults.

a) The user program and blocks generating PAF are transferred in another place of the memory. If a preset access has to be done in user area, the value /9000 should be added to the listing address to get the real execution address. If modification has to be made into the program, the modification must be done at the address given in the listing.

b) The user program consists of placing a special block of instruction (see A6) in such arrangement that the execution of that block causes a page fault.

c) The main program checks if page fault has been correctly executed, check for LP, PSW and P'.

d) The main program cancels the condition generating the page fault and gives the control back to the block having generated the previous page fault.

e) The block is resumed and if needed the resuming instruction is ckecked to control the correct execution (MOV, MOS, COS, COA, etc...).

f) The main program controls again that the checked block has been correctly processed, then the main program returns to the user program which places a new block (see b), and the same process is repeated until the last block.

5.1. Meaning of A6 after a halt error

° A6 = 0000
Test of PF during Fetch

° A6 = 0001
Test of PF during T2 format

° A6 = 0002
Test of PF during T3 format

° A6 = 0003
Test of PF during T4 format

° A6 = 0004
Test of PF during T5 format

° A6 = 0005
Test of PF during EA of T6 format

° A6 = 0006
Test of PF during T7 format

° A6 = 0008
Test of PF during EA of T7 format

° A6 = XY09
Test PF during anticipated fetch of single word instruction
XY = Pointer in table

```
TABSW   EQU       *          A6 LEFT = SINGLE WORD INSTRUCTION TABLE
        LDK       A1,0          0
        LDR       A2,A1         1
        ABR (Z)   P             2
        ADK       A2,/F         3
        ADR       A2,A1         4
        SUK       A2,1          5
        SUR       A1,A2         6
        NGR       A1,A2         7
        NGR       A2,P          8
        ANK       A1,F          A
        ANR       A1,A2         B
        TM        A1,A2         C
        ORK       A1,/F         D
        ORR       A1,A2         E
        XRK       A1,/F         F
        XRR       A1,A2         10
        SLA       A1,0          11
        DRL       31            12
        DNR       A1            13
        RF (Z)    **2           14
        CWR       A1,P          15
        ECR       A1,A2         16
        MVF       A3            17
        MVB       A3            18
        C1R       A1,A2         19
        C1R       A1,P          20
        TNM       A1,A2         21
        SLN       A3,A1         22
        DRA       31            23
        MUR       A1            24
        DATA      /FFFF
```

° A6 = XY0A
Test PF during anticipated fetch of double word instruction

XY = Pointer in the table

```
TABSW   EQU     *       A6 LEFT = DOUBLE WORD INSTRUCTION TABLE
        LD      A1,/5FFE    0
        AD      A1,/5FFE    1
        ABL (Z) 6000        2
        SU      A1,/5000    3
        SUS     A1,/5000    4
        AN      A1,/5000    5
        OR      A1,/5000    6
        XR      A1,/5000    7
        ML      1,/5000     8
        DA      /5000       9
        CF      A2,/6000    A
        SC      A1,/5000    B
        LC      A1,/5000    C
        CW      A1,/5000    D
        CC      A1,/5000    E
        CS1     /5000       F
        C1      A1,/5000    10
        ST      A1,/5000    11
        IM      /5000       12
        ADS     A1,/5000    13
        ANS     A1,/5000    14
        CM      /5000       15
        ORS     A1,/5000    16
        XRS     A1,/5000    17
        MU      /5000       18
        C2      /5000       19
        DATA    /F104       1A LDA A1,A2,/5000
        DATA    /5000
        DATA    /FFFF
```

° A6 = 000B
  Test PF on MLK instruction

° A6 = 000C
  Test PF on ML instruction

° A6 = 000D
  Test PF on MS instruction

° A6 = 000E
  Test PF on DA instruction

° A6 = 000F
  Test PF on DS instruction (EA + 2)

° A6 = 0010
  Test PF on DAK instruction (EA + 2)

° A6 = 0011
  Test PF on DSK instruction (EA + 2)

° A6 = 0012/0112
  12 test PF on FLD instruction (EA + 1)
  112 test PF on FST instruction (EA + 1)

° A6 = 0013/0113
  13 test PF on FLD instruction (EA + 2)
 113 test PF on FST instruction (EA + 2)

° A6 = 0014/0114
  14 test PF on FLD instruction (EA + 3)
 114 test PF on FST instruction (EA + 3)

° A6 = 0015
  Test PF on SC instruction

° A6 = 0016
  Test PF on a RTN instruction (during P)

° A6 = 0017
  Test PF on a RTN instruction (during PSW)

° A6 = 0018/0118
  - 0018 : Test of PF on a MVF instruction during read of source buffer and test resuming
  - 0118 : Test of PF on a MVB instruction during read of source buffer and test resuming

° A6 = 0019/0119
  - 0019 : Test PF on MVF instruction during write in destination buffer and test resuming
  - 0119 : Test of a MVB instruction during write in destination buffer and test resuming

° A6 = 001A
  Test PF on a MVF instruction during write of the last word

° A6 = 001B
  Test PF on a MVB instruction during write of the last word

° A6 = 001C
  Test PF on a C2 instruction (test of store routine)

° A6 = 001D/011D
  - 001D : Test PF on a CF instruction (during P)
  - 011D : Test PF on a CF instruction (during PSW)

° A6 = 001E
  Test PF on a MVS instruction during write in destination buffer and test resuming

° A6 = 001F
  Test PF on a MVS instruction during read in source buffer and test resuming

° A6 = 0020
Test PF on a MVA instruction during write in destination buffer and test resuming

° A6 = 0021
Test PF on a CS instruction during read in destination buffer and test resuming

° A6 = 0022
Test PF on a CS instruction during read in source buffer and test resuming

° A6 = 0023
Test PF on a CA instruction during read in buffer and test resuming

° A6 = 0024/124
- 0024 : Test PF on a TRB instruction during read in buffer and test resuming
- 0124 : Test TRB instruction during write in buffer and test resuming

° A6 = 0025/125
- 0025 : Test PF on TSB instruction during read in buffer and test resuming
- 0125 : Test PF on TSB instruction during write in buffer and test resuming

° A6 = 0026
Test PF on TB instruction during read in buffer and test resuming

° A6 = XY27
Test PF during store function of some instruction
XY = Pointer in table

```
TABST   EQU     *           A6 LEFT =
        ST      A1,/6000       0
        IM      /6000          1
        ADS     A1,/6000       2
        ANS     A1,/6000       3
        CM      /6000          4
        ORS     A1,/6000       5
        XRS     A1,/6000       6
        C1S     /6000          7
        DATA    /FFFF
```

° A6 = XX28
Test PF during second word of instruction
XY = Pointer in table

```
TABT2   EQU     *              A6 LEFT =
        ABL (1) /4FFE             0
        ABL (0) RET               1
        LDKL    P,/5002           2
        ADKL    A1,/AAAA          3
        ADKL    P,0               4
        ANKL    A1,/AAAA          5
        MUK     /0001             6
        DVK     /0001             7
        LCK     A1,/AA00          8
        CCK     A1,/AA00          9
        DATA    /F108            10
        DATA    /0000  LDR A1,0,A2
        DATA    /F100            11
        DATA    /0000  LDA A1,0,P
        EXK     /1701  ADK A7,1  12
        CF      A14,TSTCFT2      13
        XRKL    A1,/AAAA         14
        DATA    /D020            15
        DATA    0      DAK
        MLK     1                16
        DATA    0
        DATA    /FFFF
```

° A6 = XX29
Test PF during EA of format T3
XY = Pointer in table

```
TABT3    EQU       *      A6 LEFT =
         EXR*      A4        0
         STR       A1,A4     1
         ABR (1)*  A5        2
         ABR (0)*  A5        3
         ADR*      A1,A4     4
         DAR*      A4        5
         DSR*      A4        6
         IMR       A4        7
         ANR*      A1,A4     8
         MUR*      A4        9
         LCR       A1,A4    10
         SCR       A1,A4    11
         CCR       A1,A4    12
         CFR*      A14,A1   13
         C1R*      A1,A4    14
         XRR*      A1,A4    15
         ADRS      A1,A4    16
         ANRS      A1,A4    17
         C1RS      A4       18
         XRRS      A1,A4    19
         LDR*      P,A5     20
         ADR*      P,A3     21
         CFR       A5,A2    22
         MLR       1,A4     23
         MLR       2,A4     24
         MLR       2,A2     25
         MLR       3,A2     26
         MSR       1,A4     27
         MSR       2,A4     28
         MSR       3,A4     29
         DATA      /FFFF
```

° A6 = XX2A
Test PF during EA on an Execute of an instruction
Format T3
XX = Pointer in table

```
TABT3EX  EQU       *          A6 LEFT =
         ABR(0)*   A2            0
         ABR(2)*   A2            1
         LDR*      A1,A2          2
         STR       A1,A2          3
         ADR*      A1,A2          4
         DAR*      A2             5
         DSR*      A2             6
         IMR       A2             7
         ANR*      A1,A2          8
         MUR*      A2             9
         LCR       A1,A2         10
         SCR       A1,A2         11
         CCR       A1,A2         12
         C1R*      A1,A2         13
         XRR*      A1,A2         14
         ADRS      A1,A1         15
         ANRS      A1,A2         16
         C1RS      A2            17
         XRRS      A1,A2         18
         LDR*      P,A2          19
         ADR*      P,A3          20
         MLR       2,A2          21
         MLR       1,A2          22
         MSR       2,A2          23
         MSR       1,A2          24
         MSR       3,A2          25
         DATA      /FFFF
```

° A6 = XX2B
Test PF during format T3 followed by format T8
XY = Pointer in table

```
TBT3T8   EQU                    A6 LEFT =
         STR       A1,A2          0
         SCR       A1,A2          1
         DATA      /FFFF
```

° A6 = XX2C
Test PF on execute format T3 followed by format T8
XX = Pointer in table

```
TBT3T    EQU       *          A6 LEFT =
         DSR*      A4             0
         DAR*      A4             1
         STR       A1,A2          2
         SCR       A1,A2          3
         DATA      /FFFF
```

° A6 = XX2D
Test PF on second word of a format T5 instruction
XX = Pointer in table

```
TBT5    EQU     *               A6 LEFT =
        LD      A1,/4FFE,A3       0
        ST      A1,/4FFE,A3       1
        ABI(0)  /5006,A3          2
        ABI(1)  /5006,A3          3
        AD      A1,/4FFE,A3       4
        IM      /4FFE,A3          5
        AN      A1,/4FFE,A3       6
        CM      /4FFE,A3          7
        ML      1,/4FFE,A3        8
        MS      1,/4FFE,A3        9
        MO      /4FFE,A3         10
        DATA    /D04D            11
        DATA    /4FFE  TB /FFE,A3
        DATA    /C84D            12
        DATA    /4FFE  TRB /4FFE,A3
        DATA    /C04D            13
        DATA    /4FFE  TSB /4FFE,A3
        DS      /4FFE,A3         14
        DA      /4FFE,A3         15
        LC      A1,/4FFE,A3      16
        DATA    /B8A0            17
        ADK     A1,1   MLK,1     18
        SC      A1,/4FFE,A3      19
        CC      A1,/4FFE,A3      20
        EX      /5002,A3         21
        CFI     A14,/5004,A3     22
        C1      A1,/4FFE,A3      23
        XR      A1,/4FFE,A3      24
        ADS     A1,/4FFE,A3      25
        ANS     A1,/4FFE,A3      26
        C1S     /4FFE,A3         27
        XRS     A1,/4FFE,A3      28
        LD      P,/5006,A3       29
        ST      P,/4FFE,A3       30
        AD      P,/5008,A3       31
        DATA    /FFFF
```

° A6 = XX2E
Test PF on second word of format T6 instruction.
XX = Pointer in table

```
TBT6    EQU     *                 A6 LEFT =
        LD*     A1,/5004             0
        ST*     A1,/5008             1
        ABI(0)* /5004                2
        ABI(1)* /5004                3
        AD*     A1,/5004             4
        IM*     /5008                5
        AN*     A1,/5004             6
        CM*     /5008                7
        ML*     1,/5004              8
        ML*     1,/5008              9
        MU*     /5004               10
        DATA    /D061  TB* /5004    11
        DATA    /5004
        DATA    /C861 TRB* /5008    12
        DATA    /5008
        DATA    /C061 TSB* /5008    13
        DATA    /5008
        DS*     /5004               14
        DA*     /5004               15
        LC*     A1,/5004            16
        SC*     A1,/5008            17
        CC*     A1,/5504            18
        EX*     /500C               19
        CFI*    A14,/5010           20
        C1*     A1,/5004            21
        XR*     A1,/5004            22
        ADS*    A1,/5008            23
        ANS*    A1,/5008            24
        C1S*    /5008               25
        XRS*    A1,/5008            26
        LD*     P,/5004             27
        ST*     P,/5008             28
        AD*     P,/5014             29
        DATA    /FFFF
```

° A6 = XX2F
Test PF on indirection of format T6 instruction
XX = Pointer in table

```
TBT60P      EQU         *               A6 LEFT =
            ST*         A1,5000            0
            ABI(0)*     /5004              1
            CM*         /5000              2
            ML*         1,/5000            3
            MS*         1,/5000            4
            DATA        /D061              5
            DATA        /5000 TB* /5000
            DS*         /5000              6
            DA*         /5000              7
            ML          2,/5000            8
            ML          1,/5000            9
            LC*         A1,/5000          10
            SC*         A1,/5000          11
            CC*         A1,/5000          12
            EX*         /5008             13
            CFI*        A14,/500C         14
            ST*         P,/5000           15

            ABI(0)      /5006             16
            LC          A1,/5000          17
            DA          /5000             18
            DAR*        A4                19
            ADK         A1,1    NOP
            DS          /5000             20
            DSR*        A4                21
            ADK         A1,1    NOP
            CC          A1,/5000          22
            EX          /500A             23
            DATA        /FFFF
```

° A6 = XX30
Test PF on E.A. of format T6 instruction
XX = Pointer in table

```
TBT6FA      EQU       *          A6 LEFT =
            ABI(0)*   /4FFA         0
            LC*       A1,/4FFC      1
            SC*       A1,/4FFC      2
            CC*       A1,/4FFC      3
            EX*       /4FFC         4
            DA*       /4FFC         5
            ML*       1,/4FFC       6
            ML*       2,/4FFC       7
            MS        1,/5000       8
            MS*       1,/4FFC       9
            MS*       2,/4FFC      10
            DATA      /FFFF
```

° A6 = XX31
Test PF on E.A. of format T6 following by an instruction format T8
XX = Pointer in table

```
TBT6T8      EQU       *          A6 LEFT =
            ST*       A1,/4FFA      0
            SC*       A1,/4FFA      1
            DS*       /4FFA         2
            MS*       2,/4FFC       3
            DATA      /FFFF
```

° A6 = XX32
Test PF on first word transfered during MVF on MVB
XX = Pointer in table

```
TBMV        EQU       *          A6 LEFT =
            HLT
            MVF       A3            0
            HLT
            MVB       A3            1
            MVB       A3
            MVF       A3            2
            EXR       A4
            MVB       A3            3
            EXR       A4
            DATA      /C025 TSBA1   4
            EXR       A4
            DATA      /FFFF   PAMB
```

° A6 = XX33
  Test PF on last word transferred during MVF, MVB
  XX = Pointer in table. The table is same as preceding test (TBMV).

° A6 = 34
  Test PF on store P during a CFR instruction

° A6 = 35
  Test PF on execute format T4

° A6 = 36
  Test PF on invalid operation code

5.2. Physical block location according to A6 right

A6 Right	Physical location of the block memory From	To	Physical advise witch give the PF	LP of PF	Block name in the listing
0	AFFC	B002	B000	3	BLK000
1	AFFC	B002	AFFE	3	BLK001
2	AFF6	B000	AFFC	3	BLK002
3	AFF8	B000	AFFA	3	BLK003
4	DFF6	E000	DFFA	6	BLK004
5	BFFA	C002	BFFA	4	BLK005
6	EFF8	F000	EFF8	7	BLK006
7	CFF6	D002	CFFA	5	BLK007
8	AFF4	B000	AFF8	3	BLK008
9	BFFE	C002	C000	4	BLKSW
A	DFF2	E000	E000	6	BLKDW
B	EFFA	F004	EFFA	7	BLK011
C	CFF8	D004	CFF8	5	BLK012
D	BFF8	C004	BFF8	4	BLK013
E	AFF8	B000	AFF8	3	BLK014
F	EFF8	F000	EFF8	7	BLK015
10	DFFC	E002	DFFC	6	BLK016
11	CFFC	D002	CFFC	5	BLK017
12	BFFA	C004	BFFA	4	BLK018
13	AFF8	B002	AFF8	3	BLK019
14	EFF6	F000	EFF6	7	BLK020
15	DFFA	E000	DFFA	6	BLK021
16	CFFC	D002	CFFC	5	BLK022
17	BFFE	C004	BFFE	4	BLK023
18	AFD2	B004	AFDC	3	BLK024
19	BFD0	C002	BFDA	4	BLK025
1A	CFD2	D004	CFDC	4	BLK026
1B	AFCE	B000	AFD8	3	BLK027
1C	AFFA	AFFE	AFFA	2	BLK028
1D	CFF6	CFFE	CFFA	3	BLK029
1E	CFD2	D004	CFDC	5	BLK031
1F	DFDA	E006	DFE4	6	BLK032

A6 Right	Physical location of the block memory From	To	Physical advise witch give the PF	LP of PF	Block name in the listing
20	EFD6	F002	EFDE	7	BLK034
21	DFD0	E002	DFDA	6	BLK035
22	CFD2	D004	CFDC	5	BLK036
23	BFE2	C002	BFEA	4	BLK037
24	CFE6	D004	CFEC	5	BLK038
25	DFE0	E002	DFE6	6	BLK039
26	EFEA	F002	EFF0	7	BLK040
27	E100	E104	E100	6	BLK033
28	CFFC	D004	CFFE	5	BLKT2
29	CFE8	D008	CFFC	5	BLKT3
2A	CFF0	D002	CFFC	5	BLKT3EX
2B	CFF6	D000	CFFA	5	BLKT3T8
2C	CFEE	D000	CFFA	5	BLKT38E
2D	CFFA	D008	CFFE	5	BLKT5
2E	CFFA	D016	CFFE	5	BLKT6
2F	CFFE	D00E	CFFA	5	BLKT60P
30	CFF2	D002	CFF6	5	BLKT6EA
31	CFF2	D000	CFF2	5	BLKT6T8
32	CFEE	D002	CFFC	5	BLK041
33	CFEC	D000	CFFA	5	BLK042
34	CFF4	CFFE	CFFC	3	BLK043
35	CFFA	D000	CFFA	5	BLK044
36	CFFE	D002	D000	5	BLK045