```
  LOC        OBJECT CODE      ADDR1     ADDR2    STMT

                                                    2 *********************************************************************
                                                    3 *                            PERZAD.ASM
                                                    4 *********************************************************************
                                                    5 *
                                                    6 *   This program performs a quick test of PER Zero-Address Detection.
                                                    7 *
                                                    8 *   It is NOT an exhaustive test. It only tests a few instructions
                                                    9 *   to verify the PER Zero-Address Detection event either does, or
                                                   10 *   does not occur, for only a few of the more popular instructions.
                                                   11 *
                                                   12 *   Refer to pages 4-38 and 4-39 ("Zero-Address Detection") of the
                                                   13 *   SA22-7832-12 "z/Architecture Principles of Operation" manual for
                                                   14 *   more information about the PER Zero-Address Detection Facility.
                                                   15 *
                                                   16 *********************************************************************
```

```
  LOC        OBJECT CODE      ADDR1     ADDR2    STMT

                                                  18 ********************************************************************
                                                  19 *                              Low Core
                                                  20 ********************************************************************


00000000                      00000000  00000955   22 PERZAD    START 0
00000000                      00000000              23           USING PERZAD,R0



00000000                      00000000  0000008C   25           ORG   PERZAD+X'8C'        Program interrupt code
0000008C   00000000                                 26 PGMCODE   DC    F'0'                Program interrupt code
                              00000080  00000001   27 PGM_PER_EVENT  EQU  X'80'            PER Event program interrupt code
                                                  28


00000090                      00000090  00000096   30           ORG   PERZAD+X'96'        PER interrupt fields
00000096   0000                                     31 PERCODE   DC    XL2'00'             PER interrupt code
00000098   00000000 00000000                        32 PERADDR   DC    AD(0)               PER interrupt address



                              00000150  00000000   34 PGMOPSW   EQU   PERZAD+X'150'       z Program Old PSW


000000A0                      000000A0  000001A0   36           ORG   PERZAD+X'1A0'       z Restart New PSW
000001A0   00000001 80000000                        37           DC    X'0000000180000000'
000001A8   00000000 00000200                        38           DC    AD(GO)


000001B0                      000001B0  000001D0   40           ORG   PERZAD+X'1D0'       z Program New PSW
000001D0   00000001 80000000                        41           DC    X'0000000180000000'
000001D8   00000000 000002CC                        42           DC    AD(PGMRUPT)



000001E0                      000001E0  00000200   44           ORG   PERZAD+X'200'       Start of actual program...
```

```
  LOC        OBJECT CODE     ADDR1      ADDR2     STMT

                                                    46 ****************************************************************************
                                                    47 *                          Begin tests...
                                                    48 ****************************************************************************

00000200  EB9B 0928 002F               00000928    50 GO       LCTLG R9,R11,PERCTL        Init CR9-CR11 PER Control Registers
00000206  8000 0940                    00000940    51         SSM   ENPER                Enable Program Event Recording

0000020A  D201 0000 0948    00000000   00000948    53         MVC   0(2,R0),=XL2'0700'     (just go on to next instruction)
00000210  D203 0002 0944    00000002   00000944    54         MVC   2(4,R0),=XL4'47F00000' (to be fixed by tests before use)
                                                    55
                            00000216   00000001    56 BEGRANGE EQU   *                     Begin of PER Range
```

```
  LOC        OBJECT CODE      ADDR1      ADDR2    STMT

                                                   58 *******************************************************************************
                                                   59 *      Instructions that should NEVER cause a PER ZAD event...
                                                   60 *******************************************************************************

00000216   EB0F 0888 0004                00000888   62            LMG    R0,R15,ZEROREGS    Initialize all registers to zero

0000021C   4110 0000                     00000000   64            LA     R1,0
00000220   1811                                     65            LR     R1,R1
00000222   1E11                                     66            ALR    R1,R1
00000224   1F11                                     67            SLR    R1,R1
00000226   1511                                     68            CLR    R1,R1
00000228   1211                                     69            LTR    R1,R1

0000022A   4120 0002                     00000002   71            LA     R2,2               R2 --> branch instruction in low core
0000022E   D201 2002 094A     00000002   0000094A   72            MVC    2(2,R2),=S(B)
00000234   47F0 1000                     00000000   73            B      0(,R1)
                              00000238   00000001   74 B          EQU    *

00000238   D201 2002 094C     00000002   0000094C   76            MVC    2(2,R2),=S(BR)
0000023E   07F1                                     77            BR     R1
                              00000240   00000001   78 BR         EQU    *

00000240   D201 2002 094E     00000002   0000094E   80            MVC    2(2,R2),=S(BCTR)
00000246   4130 0003                     00000003   81            LA     R3,3
0000024A   0631                                     82            BCTR   R3,R1
                              0000024C   00000001   83 BCTR       EQU    *

0000024C   D201 2002 0950     00000002   00000950   85            MVC    2(2,R2),=S(EX)
00000252   1830                                     86            LR     R3,R0
00000254   4430 1000                     00000000   87            EX     R3,0(,R1)
                              00000258   00000001   88 EX         EQU    *
```

```
  LOC        OBJECT CODE     ADDR1     ADDR2    STMT

                                               90 *****************************************************************************
                                               91 *    Instructions that should ALWAYS cause a PER ZAD event...
                                               92 *****************************************************************************

00000258  EB0F 0888 0004              00000888   94          LMG   R0,R15,ZEROREGS    Reset all registers back to zero

0000025E  5800 1000                   00000000   96 ZAD01    L     R0,0(,R1)

00000262  5000 1000                   00000000   98 ZAD02    ST    R0,0(,R1)

00000266  9180 1000                   00000000  100 ZAD03    TM    0(R1),X'80'

0000026A  D200 1000 2000    00000000  00000000  102 ZAD04    MVC   0(1,R1),0(R2)

00000270  D500 1000 2000    00000000  00000000  104 ZAD05    CLC   0(1,R1),0(R2)

00000276  5500 1000                   00000000  106 ZAD06    CL    R0,0(,R1)

0000027A  9500 1000                   00000000  108 ZAD07    CLI   0(R1),X'00'

0000027E  BF0F 1000                   00000000  110 ZAD08    ICM   R0,15,0(R1)

00000282  4300 1000                   00000000  112 ZAD09    IC    R0,0(,R1)

00000286  980F 1000                   00000000  114 ZAD10    LM    R0,R15,0(R1)

0000028A  4800 1000                   00000000  116 ZAD11    LH    R0,0(,R1)

0000028E  9680 1000                   00000000  118 ZAD12    OI    0(R1),X'80'

00000292  4130 0001                   00000001  120          LA    R3,1               Destination length must be non-zero
00000296  4150 00FF                   000000FF  121          LA    R5,X'FF'           Pad char to make src len reg non-zero
0000029A  8950 0018                   00000018  122          SLL   R5,24              Move into high-order byte position

0000029E  0E24                                  124 ZAD13    MVCL  R2,R4

000002A0  0F24                                  126 ZAD14    CLCL  R2,R4
```

```
  LOC        OBJECT CODE     ADDR1     ADDR2     STMT

                                                 128 *******************************************************************
                                                 129 *          Verify we've seen ALL expected PER ZAD events...
                                                 130 *******************************************************************

                    000002A2  00000001           132 ENDRANGE EQU    *                       End of PER Range

000002A2  4110 0800                   00000800   134          LA     R1,ZADOKTAB             R1 --> table
000002A6  4120 000E                   0000000E   135          LA     R2,NUMZADS              R2 <== number of table entries

000002AA  95FF 1001                   00000001   137 DONELOOP CLI    1(R1),X'FF'             Have we seen this event?
000002AE  A774 0008                   000002BE   138          JNE    DONEFAIL                No?! ** FAIL!! **

000002B2  4110 1008                   00000008   140          LA     R1,L'ZADOKTAB(,R1)      Bump to next table entry
000002B6  4620 02AA                   000002AA   141          BCT    R2,DONELOOP             Loooop... through all entries

000002BA  A7F4 02E3                   00000880   143          J      SUCCESS                 Done! Successful Test!


                                                 145 *******************************************************************
                                                 146 *          FAIL!  Missing PER Zero-Address Detection Event!
                                                 147 *******************************************************************

000002BE  D201 0922 0952  00000922    00000952   149 DONEFAIL MVC    BADPSW+8+2(2),=XL2'0BAD' Indicate test failure
000002C4  9203 0927                   00000927   150          MVI    BADPSW+16-1,BADNOZAD    Indicate failure code
000002C8  A7F4 02DE                   00000884   151          J      FAILURE                 ** FAIL!! **
```

```
  LOC        OBJECT CODE      ADDR1     ADDR2    STMT

                                                 153 ****************************************************************************
                                                 154 *                    Program Interrupt Handler...
                                                 155 ****************************************************************************

000002CC  9180 008F                     0000008F 157 PGMRUPT  TM    PGMCODE+3,PGM_PER_EVENT  Expected interrupt?
000002D0  A784 02D0                     00000870 158          JZ    ABORT                    No?! ** ABORT!! **

000002D4  9504 0096                     00000096 160          CLI   PERCODE,ZADEVENT         Zero-Address Detection event?
000002D8  4780 02EA                     000002EA 161          BE    ZADCHECK                 Yes, go check event address

000002DC  D201 0922 0954      00000922  00000954 163          MVC   BADPSW+8+2(2),=XL2'DEAD'  Indicate PGMRUPT failure
000002E2  9201 0927                     00000927 164          MVI   BADPSW+16-1,BADPER       Indicate failure code
000002E6  A7F4 02CF                     00000884 165          J     FAILURE                  ** FAIL!! **

000002EA  EB0F 0328 0024                00000328 167 ZADCHECK STMG  R0,R15,PGMREGS           Save caller's registers
000002F0  4110 0800                     00000800 168          LA    R1,ZADOKTAB              R1 --> table
000002F4  4120 000E                     0000000E 169          LA    R2,NUMZADS               R2 <== number of table entries

000002F8  5830 1004                     00000004 171 ZADLOOP  L     R3,4(,R1)                R3 <== Expected Event Address
000002FC  5530 009C                     0000009C 172          CL    R3,PERADDR+4             Expected Event Address?
00000300  A774 0009                     00000312 173          JNE   ZADNEXT                  No, try next entry

00000304  92FF 1001                     00000001 175          MVI   1(R1),X'FF'              Yes, flag as having been seen
00000308  EB0F 0328 0004                00000328 176          LMG   R0,R15,PGMREGS           Restore caller's registers
0000030E  B2B2 0150                     00000150 177          LPSWE PGMOPSW                  Return to caller...

00000312  4110 1008                     00000008 179 ZADNEXT  LA    R1,L'ZADOKTAB(,R1)       Bump to next table entry
00000316  4620 02F8                     000002F8 180          BCT   R2,ZADLOOP               Loooop... to try next entry

0000031A  D201 0922 0952      00000922  00000952 182          MVC   BADPSW+8+2(2),=XL2'0BAD'  Indicate test failure
00000320  9202 0927                     00000927 183          MVI   BADPSW+16-1,BADZAD       Indicate failure code
00000324  A7F4 02B0                     00000884 184          J     FAILURE                  ** FAIL!! **

00000328  00000000 00000000                      186 PGMREGS  DC    16D'0'                   Saved GR registers 0 - 15


                                                 188 ****************************************************************************
                                                 189 *                    Test FAILURE codes...
                                                 190 ****************************************************************************

                   00000001  00000001            192 BADPER   EQU   X'01'      Unexpected PER Event Code
                   00000002  00000001            193 BADZAD   EQU   X'02'      Unexpected PER ZAD Event
                   00000003  00000001            194 BADNOZAD EQU   X'03'      Missing PER ZAD Event
```

```
  LOC        OBJECT CODE      ADDR1     ADDR2     STMT

                                                  196 ****************************************************************
                                                  197 *         Table of expected PER Zero-Address Detection events
                                                  198 ****************************************************************
000003A8                      000003A8  00000800  200          ORG    PERZAD+X'800'               Fixed table location
00000800                                          201 ZADOKTAB DC     0D'0'                       PER ZAD Addresses Table

                                                  203 *                  (nn)                     = test# ("ZADnn" label#)
                                                  204 *                       X'FF'               = event was detected
                                                  205 *                            A(xxxx)        = PER event address
                                                  206 *
                                                  207 *
                                                  208 *                  VV   VV    VVVV

00000800  01000000 0000025E                       210          DC     AL1(01),X'00',XL2'00',A(ZAD01)
00000808  02000000 00000262                       211          DC     AL1(02),X'00',XL2'00',A(ZAD02)
00000810  03000000 00000266                       212          DC     AL1(03),X'00',XL2'00',A(ZAD03)
00000818  04000000 0000026A                       213          DC     AL1(04),X'00',XL2'00',A(ZAD04)
00000820  05000000 00000270                       214          DC     AL1(05),X'00',XL2'00',A(ZAD05)
00000828  06000000 00000276                       215          DC     AL1(06),X'00',XL2'00',A(ZAD06)
00000830  07000000 0000027A                       216          DC     AL1(07),X'00',XL2'00',A(ZAD07)
00000838  08000000 0000027E                       217          DC     AL1(08),X'00',XL2'00',A(ZAD08)
00000840  09000000 00000282                       218          DC     AL1(09),X'00',XL2'00',A(ZAD09)
00000848  0A000000 00000286                       219          DC     AL1(10),X'00',XL2'00',A(ZAD10)
00000850  0B000000 0000028A                       220          DC     AL1(11),X'00',XL2'00',A(ZAD11)
00000858  0C000000 0000028E                       221          DC     AL1(12),X'00',XL2'00',A(ZAD12)
00000860  0D000000 0000029E                       222          DC     AL1(13),X'00',XL2'00',A(ZAD13)
00000868  0E000000 000002A0                       223          DC     AL1(14),X'00',XL2'00',A(ZAD14)
                              0000000E  00000001  224 NUMZADS  EQU    (*-ZADOKTAB)/8         Number of table entries


                                                  226 ****************************************************************
                                                  227 *         ABORT test run due to unexpected program interrupt
                                                  228 ****************************************************************
00000870  D201 0922 0954      00000922  00000954  230 ABORT    MVC    BADPSW+8+2(2),=XL2'DEAD'
00000876  D203 0924 008C      00000924  0000008C  231          MVC    BADPSW+16-L'PGMCODE(L'PGMCODE),PGMCODE
0000087C  A7F4 0004                     00000884  232          J      FAILURE


                                                  234 ****************************************************************
                                                  235 *         Successful completion / Abnormal termination
                                                  236 ****************************************************************
00000880  B2B2 0908                     00000908  238 SUCCESS  LPSWE     GOODPSW          Load test completed successfully PSW
00000884  B2B2 0918                     00000918  239 FAILURE  LPSWE     BADPSW           Load the test FAILED somewhere!! PSW
```

```
  LOC        OBJECT CODE      ADDR1     ADDR2    STMT

                                                 241 ***********************************************************************
                                                 242 *                           WORKING STORAGE
                                                 243 ***********************************************************************

00000888   00000000 00000000                     245 ZEROREGS DC    16D'0'                     ZEROED GR registers 0 - 15

00000908   00020001 80000000                     247 GOODPSW  DC    XL8'0002000180000000'
00000910   00000000 00000000                      248          DC    XL4'00000000',A(X'00000000')

00000918   00020001 80000000                     250 BADPSW   DC    XL8'0002000180000000'
00000920   0000DEAD 000000FF                      251          DC    XL4'0000DEAD',A(X'000000FF')  (FF = Reason for Failure)

                      04000000  00000001          253 CR9_ZEROADDR    EQU  X'04000000'           Zero-address Detection
                      00000004  00000001          254 ZADEVENT EQU   X'04'                      Zero-address Detection event

00000928   00000000 04000000                      256 PERCTL   DC    AD(CR9_ZEROADDR)           PER events
00000930   00000000 00000216                      257          DC    AD(BEGRANGE)               CR10 = Range begining address
00000938   00000000 000002A2                      258          DC    AD(ENDRANGE)               CR11 = Range ending   address

00000940   40                                     260 ENPER    DC    B'01000000'                Enable PER bit in PSW

00000944                                          262          LTORG ,                          Literals Pool
00000944   47F00000                               263                =XL4'47F00000'
00000948   0700                                   264                =XL2'0700'
0000094A   0238                                   265                =S(B)
0000094C   0240                                   266                =S(BR)
0000094E   024C                                   267                =S(BCTR)
00000950   0258                                   268                =S(EX)
00000952   0BAD                                   269                =XL2'0BAD'
00000954   DEAD                                   270                =XL2'DEAD'

                      00000000  00000001          272 R0       EQU   0                          Register equates
                      00000001  00000001          273 R1       EQU   1
                      00000002  00000001          274 R2       EQU   2
                      00000003  00000001          275 R3       EQU   3
                      00000004  00000001          276 R4       EQU   4
                      00000005  00000001          277 R5       EQU   5
                      00000006  00000001          278 R6       EQU   6
                      00000007  00000001          279 R7       EQU   7
                      00000008  00000001          280 R8       EQU   8
                      00000009  00000001          281 R9       EQU   9
                      0000000A  00000001          282 R10      EQU   10
                      0000000B  00000001          283 R11      EQU   11
                      0000000C  00000001          284 R12      EQU   12
                      0000000D  00000001          285 R13      EQU   13
                      0000000E  00000001          286 R14      EQU   14
                      0000000F  00000001          287 R15      EQU   15

                                                 289          END
```

SYMBOL	TYPE	VALUE	LENGTH	DEFN	REFERENCES
ABORT	I	0000870	6	230	158
B	U	0000238	1	74	72
BADNOZAD	U	0000003	1	194	150
BADPER	U	0000001	1	192	164
BADPSW	X	0000918	8	250	149 150 163 164 182 183 230 231 239
BADZAD	U	0000002	1	193	183
BCTR	U	000024C	1	83	80
BEGRANGE	U	0000216	1	56	257
BR	U	0000240	1	78	76
CR9_ZEROADDR	U	4000000	1	253	256
DONEFAIL	I	00002BE	6	149	138
DONELOOP	I	00002AA	4	137	141
ENDRANGE	U	00002A2	1	132	258
ENPER	B	0000940	1	260	51
EX	U	0000258	1	88	85
FAILURE	I	0000884	4	239	151 165 184 232
GO	I	0000200	6	50	38
GOODPSW	X	0000908	8	247	238
IMAGE	1	0000000	2390	0	
NUMZADS	U	000000E	1	224	135 169
PERADDR	A	0000098	8	32	172
PERCODE	X	0000096	2	31	160
PERCTL	A	0000928	8	256	50
PERZAD	J	0000000	2390	22	25 30 34 36 40 44 200 23
PGMCODE	F	000008C	4	26	157 231
PGMOPSW	U	0000150	0	34	177
PGMREGS	D	0000328	8	186	167 176
PGMRUPT	I	00002CC	4	157	42
PGM_PER_EVENT	U	0000080	1	27	157
R0	U	0000000	1	272	23 53 54 62 86 94 96 98 106 110 112 114 116 167 176
R1	U	0000001	1	273	64 65 66 67 68 69 73 77 82 87 96 98 100 102 104 106 108 110 112 114 116 118 134 137 140 168 171 175 179
R10	U	000000A	1	282	
R11	U	000000B	1	283	50
R12	U	000000C	1	284	
R13	U	000000D	1	285	
R14	U	000000E	1	286	
R15	U	000000F	1	287	62 94 114 167 176
R2	U	0000002	1	274	71 72 76 80 85 102 104 124 126 135 141 169 180
R3	U	0000003	1	275	81 82 86 87 120 171 172
R4	U	0000004	1	276	124 126
R5	U	0000005	1	277	121 122
R6	U	0000006	1	278	
R7	U	0000007	1	279	
R8	U	0000008	1	280	
R9	U	0000009	1	281	50
SUCCESS	I	0000880	4	238	143
ZAD01	I	000025E	4	96	210
ZAD02	I	0000262	4	98	211
ZAD03	I	0000266	4	100	212
ZAD04	I	000026A	6	102	213
ZAD05	I	0000270	6	104	214

```
       SYMBOL          TYPE    VALUE     LENGTH    DEFN   REFERENCES

ZAD06               I     0000276        4    106   215
ZAD07               I     000027A        4    108   216
ZAD08               I     000027E        4    110   217
ZAD09               I     0000282        4    112   218
ZAD10               I     0000286        4    114   219
ZAD11               I     000028A        4    116   220
ZAD12               I     000028E        4    118   221
ZAD13               I     000029E        2    124   222
ZAD14               I     00002A0        2    126   223
ZADCHECK            I     00002EA        6    167   161
ZADEVENT            U     0000004        1    254   160
ZADLOOP             I     00002F8        4    171   180
ZADNEXT             I     0000312        4    179   173
ZADOKTAB            D     0000800        8    201   224   134   140   168   179
ZEROREGS            D     0000888        8    245    62    94
=S(B)               S     000094A        2    265    72
=S(BCTR)            S     000094E        2    267    80
=S(BR)              S     000094C        2    266    76
=S(EX)              S     0000950        2    268    85
=XL2'0700'          X     0000948        2    264    53
=XL2'0BAD'          X     0000952        2    269   149   182
=XL2'DEAD'          X     0000954        2    270   163   230
=XL4'47F00000'      X     0000944        4    263    54
```

MACRO   DEFN REFERENCES

No defined macros

```
    DESC    SYMBOL  SIZE    POS       ADDR

Entry: 0

Image     IMAGE   2390  000-955   000-955
   Region         2390  000-955   000-955
     CSECT  PERZAD 2390  000-955   000-955
```

    STMT   FILE NAME

1   c:\Users\Fish\Documents\Visual Studio 2008\Projects\MyProjects\ASMA-0\PERZAD\PERZAD.asm

** NO ERRORS FOUND **