

## **z390VSE User Guide**

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## 1. Introductions

The z390 open source portable mainframe assembler and emulator tool now supports the assembly, linking, and execution of VSE mainframe assembler programs using a VSE macro library. The VSE macros map into z390 MVS macros and require that the default z390 MVS macro library be concatenated behind the z390 VSE macro library.

z390 VSE support includes the following VSE macros: CDLOAD, CDDELETE, CLOSE, COMRG, DTFPR, DTFSD, EOJ, FREEVIS, GETIME, GETVIS, and OPEN. z390 MVS and user macros which require no changes for VSE can also be used including CALL, GET, PUT, SUBENTRY, SUBEXIT, etc.

The VSE support includes 3 demo programs:

1. DEMOVSE1.MLC – Display “Hello World” and also current date and time using the COMRG and GETIME VSE macros in addition to MVS compatible WTO macro.
2. DEMOVSE2.MLC – Use the CDLOAD macro to load the z390 demo program demo\DEMOWTO1.MLC, call it, and then use CDDELETE to delete the loaded program from memory.
3. DEMOVSE3.MLC – Use the OPEN, GET, PUT, CLOSE, DTFSD, and DTFPR macros to copy a file.
- 4.

See section 3 for more information about these demos and also see the Appendix for source program, assembly listing, and execution log and trace for the first demo.

Also included are the regression test commands RTVSE.BAT and RTVSE1.BAT. Entering the command RTVSE will assemble, link, execute, and verify results for all 3 demos plus the first additional regression test vse\test\TESTVSE1.MLC which uses GETVIS and FREEVIS to convert rt\test\TESTMEM1.MLC regression test to VSE equivalent test of dynamic storage allocation and de-allocation above and below the 16 MB line.

Additional VSE macros, demos, and regression tests will be added as requested.

## 2. VSE Macros

1. **CDDELETE** – delete loaded program from memory (maps to DELETE)
2. **CDLOAD** - load program into memory (maps to LOAD)
3. **CLOSE** - close one or more DTF files (maps to svc 20)
4. **COMRG** - return address of system communications area in ZCVTD
5. **DTFPR** - define a sequential printer output file (maps to DCB)
6. **DTFSD** - define a sequential disk file (maps to DCB)
7. **EOJ** - exit main program (maps to EXIT svc 3)
8. **FREEVIS** - release dynamically allocated memory (maps to FREEMAIN)
9. **GETIME** - get current time (maps to TIME)
10. **GETVIS** - dynamically allocate memory (maps to GETMAIN)
11. **OPEN** - open one or more DTF files (maps to svc 19)

### 3. VSE Demo Programs

The first “Hello World” demo program source, assembly listing, execution log, and execution trace are included in the Appendix. After extracting the z390 v1302b cumulative PTF zip into the install directory of the v1.3.02 z390 version, the following command can be used to assemble, link, and execute the first demo program with trace on Windows or Linux:

```
asmlg vse\demo\DEMOVSE1 sysmac(vse\mac+mac) amode24 trace
```

Note the default z390 MVS macro library z390\mac is concatenated with the new z390\vse\mac macro library for use of WTO in addition to COMRG and GETIME. Note the default z390 AMODE is 31 so the option amode24 can be used if necessary.

The second demo program can be assembled, linked and executed with the command:

```
asmlg vse\demo\DEMOVSE2 sysmac(vse\mac+mac) sys390(vse\demo+demo)
```

Note the z390 executable program directory z390\demo has been included to enable CDLOAD to find and load the demo DEMOWTO1.390 program which it then calls, and then deletes from memory.

The third demo program can be assembled, linked, and executed with the following three commands:

```
set SYSUT1=vse\demo\DEMOVSE3.TF1  
set STSUT2=vse\demo\DEMOVSE3.TF2  
asmlg vse\demo\DEMOVSE3 sysmac(vse\mac+mac)
```

This program copies the existing file defined by SYSUT1 DTFSD macro to the new file defined by SYSUT2 DTFPR macro. Note the DTF macros all use their label as DDNAME for generated DCB allowing SET commands to define the real file names. The existing file z390\vse\demo\DEMOVSE3.TF1 consists of 3 – 80 byte EBCDIC records which you can see in memory using trace or test.

#### **4. Regression tests**

**The following regression test programs are included:**

- 5. TESTVSE1 - test GETVIS and FREEVIS dynamic memory allocation. This program was converted from MVS regression test rt\test\testmem1. Note that since VSE GETVIS has default RMODE24 where as MVS GETMAIN sets RMODE based on type, additional logic had to added to this test program to check MVS request type to set correct explicit RMODE.**

**To run all the VSE regression tests including the demos and test programs, use the command RTVSE.BAT. This assembles, links, and executes each program and then verifies that the source and generated files all match the files saved after last change. Note the regression test for vse\demo\DEMOVSE3 uses the z390 regression test RT5.BAT to set the standard DDNAME's SYSUT1 and SYSUT2 to data files with name of program suffixed by TF1 and TF2 respectively. RT5 is also used for all the MVS DCB regression tests defined in RTTEST1.BAT.**

**6. References:**

1. For latest z390 downloads and additional information visit [www.z390.org](http://www.z390.org)
2. For VSE macro references see the IBM VSE links here:

[http://www.automatedsoftwaretools.com/z390/#IBM Reference Links](http://www.automatedsoftwaretools.com/z390/#IBM%20Reference%20Links)

## 5. Appendix

### Appendix I: Demo application source code DEMOVSE1.MLC

```

*****
* Copyright 2007 Automated Software Tools Corporation *
* This source code is part of z390 assembler/emulator package *
* The z390 package is distributed under GNU general public license *
* Author - Don Higgins *
* Date - 03/11/07 *
*****
* YOU CAN ASSEMBLE, LINK, AND EXECUTE THIS DEMO
* USING Z390 GUI INTERFACE BY ENTERING DEMO IN COMMAND BOX
* OR BY EXECUTING DEMO FROM WINDOWS COMMAND LINE
* WITH CURRENT DIRECTORY SET TO Z390 INSTALL DIRECTORY WHICH
* IS "C:\PROGRAM FILES\AUTOMATED SOFTWARE TOOLS\Z390"
* ENTER THE COMMAND:
*
* ASMLG vse\demo\DEMOVSE1 sysmac(vse\mac+mac)
*
* THE Z390 TOOLKIT IS DISTRIBUTED IN SOURCE AND EXECUTABLE
* FORMAT UNDER OPEN SOURCE GPL LICENSE. VISIT WWW.Z390.ORG
* FOR MORE INFORMATION.
*****
        TITLE 'DEMOVSE1 Z390 VSE HELLO WORLD DEMO'
DEMOVSE1 CSECT
        BALR 12,0
        USING *,12
        WTO 'DEMOVSE1 HELLO WORLD'
        COMRG , GET VSE COMMUNICATIONS AREA IN REG 1
        USING IHACOMRG,1
        MVC JOBDATE,COMRG_JOBDATE
        GETIME ,CLOCK=NO SET R1= CURRENT TOD PD 0HHMMSSC
        ST 1,PWORK+4 STORE PD TOD 0HHMMSSC
        MVC TIME,TIMEMASK
        ED TIME,PWORK+4
        WTO MF=(E,WTOMSG)
        EOJ , EXIT PROGRAM
        LTORG
PWORK DC PL8'0'
WTOMSG DC AL2(WTOEND-*,0)
        DC C'DEMOVSE1 COMRG JOBDATE '
JOBDATE DC C'MM/DD/YY'
        DC C' GETIME CURRENT TIME'
TIME DC C' HH:MM:SS'
WTOEND EQU *
TIMEMASK DC C' ',X'202120',C':',X'2020',C':',X'2020' HH:MM:SS
IHACOMRG DSECT
COMRG_JOBDATE DS CL8 0 8 MM/DD/YY (SET IF TIMING)
COMRG_RESV1 DS XL4 8 4 RESERVED
COMRG_COMUSCR DS XL11 12 11 USER AREA (ZERO'D)
COMRG_UPSI DS B 23 1 SWITCH BITS
COMRG_COMNAME DS CL8 24 8 JOBNAME (SET TO PGMNAME)
COMRG_PPEND DS A 32 4 ADDR HIGH PGM
COMRG_HTPHAS DS A 36 4 ADDR HIGH LAST PH
COMRG_HTPROG DS A 40 4 ADDR HIGH MAX PH ID4

```

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COMRG_LABELN	DS	H	44	2	LENGTH OF LABEL
COMRG_RESV2	DS	XL2	46	2	RESERVED LENGTH ??????
COMRG_IJBPHLA	DS	A	48	4	ADDR HIGH MAX PH ANY
END					

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## Appendix II: Demo application assembly listing DEMOVSE1.PRN

```
AZ390I V1.3.02b Current Date 03/13/07 Time 04:49:30
Copyright 2006 Automated Software Tools Corporation
z390 is licensed under GNU General Public License
AZ390I program = vse\demo\DEMOVSE1.BAL
AZ390I options = sysmac(D:\work\z390\mac+.) syscpy(D:\work\z390\mac+.)
sysmac(vse\mac+mac) amode24 trace
External Symbol Definitions
  ESD=0001 LOC=00000000 LEN=000000B8 TYPE=CST NAME=DEMOVSE1
Assembler Listing
000000 (1/1)1
*****
000000 (1/2)2 * Copyright 2007 Automated Software
Tools Corporation *
000000 (1/3)3 * This source code is part of z390
assembler/emulator package *
000000 (1/4)4 * The z390 package is distributed
under GNU general public license *
000000 (1/5)5 * Author - Don Higgins
*
000000 (1/6)6 * Date - 03/11/07
*
000000 (1/7)7
*****
000000 (1/8)8 * YOU CAN ASSEMBLE, LINK, AND
EXECUTE THIS DEMO
000000 (1/9)9 * USING Z390 GUI INTERFACE BY
ENTERING DEMO IN COMMAND BOX
000000 (1/10)10 * OR BY EXECUTING DEMO FROM WINDOWS
COMMAND LINE
000000 (1/11)11 * WITH CURRENT DIRECTORY SET TO Z390
INSTALL DIRECTORY WHICH
000000 (1/12)12 * IS "C:\PROGRAM FILES\AUTOMATED
SOFTWARE TOOLS\Z390"
000000 (1/13)13 * ENTER THE COMMAND:
000000 (1/14)14 *
000000 (1/15)15 * ASMLG vse\demo\DEMOVSE1
sysmac(vse\mac+mac)
000000 (1/16)16 *
000000 (1/17)17 * THE Z390 TOOLKIT IS DISTRIBUTED IN
SOURCE AND EXECUTABLE
000000 (1/18)18 * FORMAT UNDER OPEN SOURCE GPL
LICENSE. VISIT WWW.Z390.ORG
000000 (1/19)19 * FOR MORE INFORMATION.
000000 (1/20)20
*****
000000 (1/21)21 TITLE 'DEMOVSE1 Z390 VSE
HELLO WORLD DEMO'
000000 (1/22)22 DEMOVSE1 CSECT
000000 05C0 (1/23)23 BALR 12,0
000002 (1/24)24 USING *,12
LISTUSE DEMOVSE1 ESD=0001 LOC=00000002 LEN=01000 REG=C OFF=00000 LAB=
000002 (1/25)25 WTO 'DEMOVSE1 HELLO
WORLD'
000002 A715000E (2/46)26+ BRAS 1,*(WTO#1_EOT-
*+1)/2*2
000006 00180000C4C5D4D6 (2/47)27+ DC AL2(WTO#1_EOT-
*,0),C'DEMOVSE1 HELLO WORLD'
00001E 00001E (2/48)28+WTO#1_EOT EQU *
00001E 0A23 (2/49)29+ SVC 35
000020 (1/26)31 COMRG , GET VSE
COMMUNICATIONS AREA IN REG 1
000020 A7182000 (3/23)33+ LHI 1,ZCVT
000024 (3/24)34+ USING IHAZCVT,1
LISTUSE DEMOVSE1 ESD=0001 LOC=00000002 LEN=01000 REG=C OFF=00000 LAB=
LISTUSE IHAZCVT ESD=0002 LOC=00000000 LEN=01000 REG=1 OFF=00000 LAB=
000024 41101600 000600 (3/27)35+ LA 1,ZCVT_COMRG
000028 (3/32)36+ DROP 1
LISTUSE DEMOVSE1 ESD=0001 LOC=00000002 LEN=01000 REG=C OFF=00000 LAB=
```

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```

000028          002000          (4/24)39+ZCVT      EQU      X'2000'  ABS ADDR
ZCVT
000000          (4/25)40+IHAZCVT DSECT
000000          (4/26)41+          ORG      IHAZCVT+X'00'
000000          (4/27)42+ZCVTUPGM DS      CL8    390 USER
PROGRAM NAME LOADED AT IPL
000008          (4/28)43+          ORG      IHAZCVT+X'08'
000008          (4/29)44+ZCVTIPLP DS      CL8    390 IPL
PROGRAM SPECIFIED IN IPL(PGM) OPTION
000010          (4/30)45+          ORG      IHAZCVT+X'10'
000010          (4/31)46+ZCVTFQ24 DS      A      ADDRESS OF
FIRST FQE FOR 24 BIT MEM AT X'10000'
000014          (4/32)47+          ORG      IHAZCVT+X'14'
000014          (4/33)48+ZCVTFQ31 DS      A      ADDRESS OF
FIRST FQE FOR 31 BIT MEM AT X'1000000'
000018          (4/34)49+          ORG      IHAZCVT+X'18'
000018          (4/35)50+ZCVTEXIT DS      XL2    SVC 3 EXIT
USED AS R14 EXIT AND STIMER EXIT
00001C          (4/36)51+          ORG      IHAZCVT+X'1C'
00001C          (4/37)52+ZCVTGECB DS      F      TGET ECB
000020          (4/38)53+          ORG      IHAZCVT+X'20'
000020          (4/39)54+ZCVTEIBP DS      A      CICS INTERFACE
CONTROL BLOCK POINTER > DFHEIBLK
000024          (4/40)55+          ORG      IHAZCVT+X'24'
000024          (4/41)56+ZCVTCAP  DS      A      CICS COMMON
AREA POINTER
000100          (4/42)57+          ORG      IHAZCVT+X'100'
000100          (4/43)58+ZCVTSAVE DS      18F    SAVE AREA USED
TO INIT USER PGM R13
000200          (4/44)59+          ORG      IHAZCVT+X'200'
000200          (4/45)60+ZCVTSAV2 DS      18F    SAVE AREA FOR
STIMER EXIT R13
000300          (4/46)61+          ORG      IHAZCVT+X'300'
000300          (4/47)62+ZCVTPARM DS      XL256  PARM AREA USED
TO SET USER R1
000400          (4/48)63+          ORG      IHAZCVT+X'400'
000400          (4/49)64+ZCVTEPIE DS      XL256  RESERVED FOR
ESPIE EPIE CB (SEE EPIED MACRO)
000500          (4/50)65+          ORG      IHAZCVT+X'500'
000500          (4/51)66+ZCVTESTA DS      XL256  RESERVED FOR
ESTAE ESTA CB (SEE ESTAD MACRO)
000600          (4/52)67+          ORG      IHAZCVT+X'600'
000600          (4/53)68+ZCVT_COMRG DS      XL1024 RESERVED FOR
VSE COMRG AREA (SEE vse\mac\COMRG)
000A00          (4/54)69+ZCVT_COMRG_JOBDATE DS      CL8
0 8 MM/DD/YY (SET IF TIMING)
000A08          (4/55)70+ZCVT_COMRG_RESV1 DS      XL4
8 4 RESERVED
000A0C          (4/56)71+ZCVT_COMRG_COMUSCR DS      XL11
12 11 USER AREA (ZERO'D)
000A17          (4/57)72+ZCVT_COMRG_UPSI   DS      B
23 1 SWITCH BITS
000A18          (4/58)73+ZCVT_COMRG_COMNAME DS      CL8
24 8 JOBNAME (SET TO PGMNAME)
000A20          (4/59)74+ZCVT_COMRG_PPEND  DS      A
32 4 ADDR HIGH PGM
000A24          (4/60)75+ZCVT_COMRG_HTPHAS DS      A
36 4 ADDR HIGH LAST PH
000A28          (4/61)76+ZCVT_COMRG_HTPROG DS      A
40 4 ADDR HIGH MAX PH ID4
000A2C          (4/62)77+ZCVT_COMRG_LABLEN DS      H
44 2 LENGTH OF LABEL
000A2E          (4/63)78+ZCVT_COMRG_RESV2 DS      XL2
46 2 RESERVERD LENGTH ?????
000A30          (4/64)79+ZCVT_COMRG_IJBHPLA DS      A
48 4 ADDR HIGH MAX PH ANY
008000          (4/65)80+ZCVTEND  ORG      IHAZCVT+(X'A000'-
X'2000') RESERVE UP TO CVT
000028          (4/66)81+DEMOVSE1 CSECT
000028          (1/27)84          USING IHACOMRG,1
LISTUSE DEMOVSE1 ESD=0001 LOC=00000002 LEN=01000 REG=C OFF=00000 LAB=

```

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```

LISTUSE IHACOMRG ESD=0003 LOC=00000000 LEN=01000 REG=1 OFF=00000 LAB=
000028 D207C0821000      000084 000000      (1/28)85      MVC  JOBDATE,COMRG_JOBDATE
00002E                      (1/29)86      GETIME ,CLOCK=NO      SET
R1= CURRENT TOD PD 0HHMMSSC
00002E 41000000                      (6/53)90+      LA  0,0  DEC  R0 = HEX
HHMMSSTH
000032 0A0B                      (6/75)91+      SVC  11 TIME AND DATE
000034 1810                      (5/28)93+      LR  1,0
000036 4310C05E                      000060      (5/29)94+      IC  1,=X'C0'
00003A 88100004                      (5/30)95+      SRL 1,4  R1=0HHMMSSC
00003E 5010C063                      000065      (1/30)97      ST  1,PWORK+4
STORE PD TOD 0HHMMSSC
000042 D209C09FC0A9      0000A1 0000AB      (1/31)98      MVC  TIME,TIMEMASK
000048 DE09C09FC063      0000A1 000065      (1/32)99      ED  TIME,PWORK+4
00004E                      (1/33)100      WTO  MF=(E,WTOMSG)
00004E 4110C067                      000069      (2/58)101+     LA  1,WTOMSG
000052 0A23                      (2/64)102+     SVC  35
000054                      (1/34)104      EOJ  ,  EXIT
PROGRAM
000054 41F00000                      (7/23)105+     LA  15,0
000058 0A03                      (7/28)106+     SVC  3 EXIT CURRENT
PROGRAM
00005A                      (1/35)108      LTORG
000060 C0                      =X'C0'
000061 0000000000000000      (1/36)109 PWORK  DC  PL8'0'
000069 00420000                      (1/37)110 WTOMSG DC  AL2(WTOEND-*,0)
00006D C4C5D4D6E5E2C5F1      (1/38)111      DC  C'DEMOVSEL COMRG
JOBDATE '
000084 D4D461C4C461E8E8      (1/39)112 JOBDATE DC  C'MM/DD/YY'
00008C 4040C7C5E3C9D4C5      (1/40)113      DC  C' GETIME CURRENT
TIME'
0000A1 4040C8C87AD4D47A      (1/41)114 TIME   DC  C' HH:MM:SS'
0000AB                      0000AB      (1/42)115 WTOEND EQU  *
0000AB 402021207A20207A      (1/43)116 TIMEMASK DC  C'
',X'202120',C':',X'2020',C':',X'2020' HH:MM:SS
000000                      (1/44)117 IHACOMRG DSECT
000000                      (1/45)118 COMRG_JOBDATE DS  CL8 0
8 MM/DD/YY (SET IF TIMING)
000008                      (1/46)119 COMRG_RESV1 DS  XL4 8
4 RESERVED
00000C                      (1/47)120 COMRG_COMUSCR DS  XL11 12
11 USER AREA (ZERO'D)
000017                      (1/48)121 COMRG_UPSI DS  B 23
1 SWITCH BITS
000018                      (1/49)122 COMRG_COMNAME DS  CL8 24
8 JOBNAME (SET TO PGMNAME)
000020                      (1/50)123 COMRG_PPEND DS  A 32
4 ADDR HIGH PGM
000024                      (1/51)124 COMRG_HTPHAS DS  A 36
4 ADDR HIGH LAST PH
000028                      (1/52)125 COMRG_HTPROG DS  A 40
4 ADDR HIGH MAX PH ID4
00002C                      (1/53)126 COMRG_LABELEN DS  H 44
2 LENGTH OF LABEL
00002E                      (1/54)127 COMRG_RESV2 DS  XL2 46
2 RESERVERD LENGTH ?????
000030                      (1/55)128 COMRG_IJBHPLA DS  A 48
4 ADDR HIGH MAX PH ANY
000034                      (1/56)129 * MZ390I total MLC/MAC loaded = 295
000034                      (1/56)130 * MZ390I total BAL output lines= 125
000034                      (1/56)131 * MZ390I total BAL instructions= 22
000034                      (1/56)132 * MZ390I total macros = 7
000034                      (1/56)133 * MZ390I total macro loads = 7
000034                      (1/56)134 * MZ390I total macro calls = 7
000034                      (1/56)135 * MZ390I total global set names= 42
000034                      (1/56)136 * MZ390I tot global seta cells = 3
000034                      (1/56)137 * MZ390I tot global setb cells = 3
000034                      (1/56)138 * MZ390I tot global setc cells = 36
000034                      (1/56)139 * MZ390I max local pos parms = 6
000034                      (1/56)140 * MZ390I max local key parms = 10
000034                      (1/56)141 * MZ390I max local set names = 15

```

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```

000034          (1/56)142 * MZ390I max local seta cells = 6
000034          (1/56)143 * MZ390I max local setb cells = 0
000034          (1/56)144 * MZ390I max local setc cells = 9
000034          (1/56)145 * MZ390I total array expansions= 0
000034          (1/56)146 * MZ390I total Keys           =
1117
000034          (1/56)147 * MZ390I Key searches         =
1776
000034          (1/56)148 * MZ390I Key avg comps        = 0
000034          (1/56)149 * MZ390I Key max comps         = 3
000034          (1/56)150 * MZ390I total macro line exec = 166
000034          (1/56)151 * MZ390I total pcode line exec = 3
000034          (1/56)152 * MZ390I total pcode line gen. = 29
000034          (1/56)153 * MZ390I total pcode line reuse= 0
000034          (1/56)154 * MZ390I total pcode op gen.  = 112
000034          (1/56)155 * MZ390I total pcode op exec  = 10
000034          (1/56)156 * MZ390I total pcode gen opt   = 41
000034          (1/56)157 * MZ390I total pcode exec opt  = 0
000034          (1/56)158 * MZ390I total milliseconds  = 532
000034          (1/56)159 * MZ390I instructions/second  = 312
000034          (1/56)160 * MZ390I FID= 1 ERR= 0
vse\demo\DEMOVSE1.MLC
000034          (1/56)161 * MZ390I FID= 2 ERR= 0 mac\WTO.MAC
000034          (1/56)162 * MZ390I FID= 3 ERR= 0
vse\mac\COMRG.MAC
000034          (1/56)163 * MZ390I FID= 4 ERR= 0
mac\ZCVTD.MAC
000034          (1/56)164 * MZ390I FID= 5 ERR= 0
vse\mac\GETIME.MAC
000034          (1/56)165 * MZ390I FID= 6 ERR= 0 mac\TIME.MAC
000034          (1/56)166 * MZ390I FID= 7 ERR= 0
vse\mac\EOJ.MAC
000034          (1/56)167          END

```

### Symbol Table Listing

```

SYM=COMRG_COMNAME LOC=00000018 LEN=00000008 ESD=0003 TYPE=REL XREF=122
SYM=COMRG_COMUSCR LOC=0000000C LEN=0000000B ESD=0003 TYPE=REL XREF=120
SYM=COMRG_HTPHAS LOC=00000024 LEN=00000004 ESD=0003 TYPE=REL XREF=124
SYM=COMRG_HTPROG LOC=00000028 LEN=00000004 ESD=0003 TYPE=REL XREF=125
SYM=COMRG_IJBHPLA LOC=00000030 LEN=00000004 ESD=0003 TYPE=REL XREF=128
SYM=COMRG_JOBDATE LOC=00000000 LEN=00000008 ESD=0003 TYPE=REL XREF=118 85
SYM=COMRG_LABELN LOC=0000002C LEN=00000002 ESD=0003 TYPE=REL XREF=126
SYM=COMRG_PPEND LOC=00000020 LEN=00000004 ESD=0003 TYPE=REL XREF=123
SYM=COMRG_RESV1 LOC=00000008 LEN=00000004 ESD=0003 TYPE=REL XREF=119
SYM=COMRG_RESV2 LOC=0000002E LEN=00000002 ESD=0003 TYPE=REL XREF=127
SYM=COMRG_UPSI LOC=00000017 LEN=00000001 ESD=0003 TYPE=REL XREF=121
SYM=DEMOVSE1 LOC=00000000 LEN=000000B8 ESD=0001 TYPE=CST XREF=22 81
SYM=IHACOMRG LOC=00000000 LEN=00000038 ESD=0003 TYPE=DST XREF=117 84
SYM=IHAZCVT LOC=00000000 LEN=00008000 ESD=0002 TYPE=DST XREF=40 34 41 43 45 47
 49 51 53 55 57 59 61 63 65 67 80
SYM=JOBDATE LOC=00000084 LEN=00000008 ESD=0001 TYPE=REL XREF=112 85
SYM=PWORX LOC=00000061 LEN=00000008 ESD=0001 TYPE=REL XREF=109 97 99
SYM=TIME LOC=000000A1 LEN=0000000A ESD=0001 TYPE=REL XREF=114 98 99
SYM=TIMEMASK LOC=000000AB LEN=00000001 ESD=0001 TYPE=REL XREF=116 98
SYM=WTO#1_EOT LOC=0000001E LEN=00000001 ESD=0001 TYPE=REL XREF=28 26 27
SYM=WTOEND LOC=000000AB LEN=00000001 ESD=0001 TYPE=REL XREF=115 110
SYM=WTOMSG LOC=00000069 LEN=00000002 ESD=0001 TYPE=REL XREF=110 101
SYM=ZCVT LOC=00002000 LEN=00000001 ESD=0000 TYPE=ABS XREF=39 33
SYM=ZCVTCAP LOC=00000024 LEN=00000004 ESD=0002 TYPE=REL XREF=56
SYM=ZCVTEIBP LOC=00000020 LEN=00000004 ESD=0002 TYPE=REL XREF=54
SYM=ZCVTEND LOC=00008000 LEN=00000004 ESD=0002 TYPE=REL XREF=80
SYM=ZCVTEPIE LOC=00000400 LEN=00000100 ESD=0002 TYPE=REL XREF=64
SYM=ZCVTESTA LOC=00000500 LEN=00000100 ESD=0002 TYPE=REL XREF=66
SYM=ZCVTEXTIT LOC=00000018 LEN=00000002 ESD=0002 TYPE=REL XREF=50
SYM=ZCVTFQ24 LOC=00000010 LEN=00000004 ESD=0002 TYPE=REL XREF=46
SYM=ZCVTFQ31 LOC=00000014 LEN=00000004 ESD=0002 TYPE=REL XREF=48
SYM=ZCVTGECB LOC=0000001C LEN=00000004 ESD=0002 TYPE=REL XREF=52
SYM=ZCVTIPLP LOC=00000008 LEN=00000008 ESD=0002 TYPE=REL XREF=44
SYM=ZCVTPARM LOC=00000300 LEN=00000100 ESD=0002 TYPE=REL XREF=62
SYM=ZCVTSAV2 LOC=00000200 LEN=00000004 ESD=0002 TYPE=REL XREF=60

```

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```
SYM=ZCVTSAVE LOC=00000100 LEN=00000004 ESD=0002 TYPE=REL XREF=58
SYM=ZCVTUPGM LOC=00000000 LEN=00000008 ESD=0002 TYPE=REL XREF=42
SYM=ZCVT_COMRG LOC=00000600 LEN=00000400 ESD=0002 TYPE=REL XREF=68 35
SYM=ZCVT_COMRG_COMNAME LOC=00000A18 LEN=00000008 ESD=0002 TYPE=REL XREF=73
SYM=ZCVT_COMRG_COMUSCR LOC=00000A0C LEN=0000000B ESD=0002 TYPE=REL XREF=71
SYM=ZCVT_COMRG_HTPHAS LOC=00000A24 LEN=00000004 ESD=0002 TYPE=REL XREF=75
SYM=ZCVT_COMRG_HTPROG LOC=00000A28 LEN=00000004 ESD=0002 TYPE=REL XREF=76
SYM=ZCVT_COMRG_IJBHPLA LOC=00000A30 LEN=00000004 ESD=0002 TYPE=REL XREF=79
SYM=ZCVT_COMRG_JOBDATE LOC=00000A00 LEN=00000008 ESD=0002 TYPE=REL XREF=69
SYM=ZCVT_COMRG_LABELN LOC=00000A2C LEN=00000002 ESD=0002 TYPE=REL XREF=77
SYM=ZCVT_COMRG_PPEND LOC=00000A20 LEN=00000004 ESD=0002 TYPE=REL XREF=74
SYM=ZCVT_COMRG_RESV1 LOC=00000A08 LEN=00000004 ESD=0002 TYPE=REL XREF=70
SYM=ZCVT_COMRG_RESV2 LOC=00000A2E LEN=00000002 ESD=0002 TYPE=REL XREF=78
SYM=ZCVT_COMRG_UPSI LOC=00000A17 LEN=00000001 ESD=0002 TYPE=REL XREF=72
```

### Literal Table Listing

```
LIT=X'C0'      LOC=00000060 LEN=00000001 ESD=0001 POOL=0001 XREF=94

AZ390I BAL lines           = 163
AZ390I symbols             = 48
AZ390I Literals            = 1
AZ390I alloc passes        = 3
AZ390I Keys                = 977
AZ390I Key searches        = 1988
AZ390I Key avg comps       = 0
AZ390I Key max comps       = 3
AZ390I ESD symbols         = 3
AZ390I object bytes        = 175
AZ390I object rlds         = 0
AZ390I total seconds       = 0
AZ390I total mnote warnings = 0
AZ390I total mnote errors  = 0 max level= 0
AZ390I total errors        = 0
AZ390I total errors        = 0
AZ390I return code(DEMOVSE1)= 0
```

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### Appendix III: VSE application execution log DEMOVSE1.LOG

```
EZ390I V1.3.02b Current Date 03/13/07 Time 04:49:32
EZ390I Copyright 2006 Automated Software Tools Corporation
EZ390I z390 is licensed under GNU General Public License
EZ390I program = DEMOVSE1
EZ390I options = sysmac(vse\mac+mac) amode24 trace
DEMOVSE1 HELLO WORLD
DEMOVSE1 COMRG JOBDATE 03/13/07 GETIME CURRENT TIME 4:49:32
EZ390I Stats total instructions = 18
EZ390I Stats current date 03/13/07 time 04:49:32
EZ390I Stats total seconds = 0
EZ390I Stats instructions/sec = 375
EZ390I total errors = 0
EZ390I return code(DEMOVSE1)= 0
```

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## Appendix IV: VSE application execution trace DEMOVSE1.TRE

```
EZ390I EZ390I V1.3.02b Current Date 03/13/07 Time 04:49:32
EZ390I EZ390I Copyright 2006 Automated Software Tools Corporation
EZ390I EZ390I z390 is licensed under GNU General Public License
EZ390I EZ390I program = DEMOVSE1
EZ390I EZ390I options = sysmac(vse\mac+mac) amode24 trace

000FFF48 0 05C0          BALR  RC=00000000 R0=000FFF48
000FFF4A 0 A715000E      BRAS  R1=00002300 S2(000FFF66)=0A23 SVC

000FFF66 0 0A23          SVC   I1=23 WTO
R1=ADDR(AL2(LEN),AL2(FLAGS),C'MSG')
EZ390I DEMOVSE1 HELLO WORLD
000FFF68 0 A7182000      LHI   R1=000FFF4E I2=2000
000FFF6C 0 41101600      LA    R1=00002000 S2(00002600)
000FFF70 0 D207C0821000 MVC  S1(000FFFCC)=D4D461C4C461E8E8
S2(00002600)=F0F361F1F361F0F7
000FFF76 0 41000000      LA    R0=000FFF48 S2(00000000)
000FFF7A 0 0A0B          SVC   I1=0B TIME R0 LH=DATETYPE, R0
LL=TIMETYPE, R1=ADDR
000FFF7C 0 1810          LR    R1=0107072F R0=04493214
000FFF7E 0 4310C05E      IC    R1=04493214 S2(000FFFA8)=C0
000FFF82 0 88100004      SRL   R1=044932C0 S2(00000004)
000FFF86 0 5010C063      ST    R1=0044932C S2(000FFFAD)=0000000C
000FFF8A 0 D209C09FC0A9 MVC  S1(000FFFE9)=4040C8C87AD4D47AE2E2
S2(000FFFF3)=402021207A20207A2020
000FFF90 0 DE09C09FC063 ED    S1(000FFFE9)=402021207A20207A2020
S2(000FFFAD)=0044932C00420000C4C5
000FFF96 2 4110C067      LA    R1=0044932C S2(000FFFB1)
000FFF9A 2 0A23          SVC   I1=23 WTO
R1=ADDR(AL2(LEN),AL2(FLAGS),C'MSG')
EZ390I DEMOVSE1 COMRG JOBDATE 03/13/07 GETIME CURRENT TIME 4:49:32
000FFF9C 2 41F00000      LA    RF=00000000 S2(00000000)
000FFFA0 2 0A03          SVC   I1=03 EXIT
EZ390I EZ390I Stats total instructions = 18
EZ390I Stats Keys = 1715
EZ390I Stats Key searches = 21
EZ390I Stats Key avg comps = 1
EZ390I Stats Key max comps = 2
EZ390I EZ390I Stats current date 03/13/07 time 04:49:32
EZ390I EZ390I Stats total seconds = 0
EZ390I EZ390I Stats instructions/sec = 375
EZ390I EZ390I total errors = 0
EZ390I EZ390I return code(DEMOVSE1)= 0
```