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Introduction

ZICE-II is a symbolic debugger and communications system for interfacing ZAX In-Circuit Debugger (ICD) emulators to Unix-, VMS-, and MS-DOS-based host computers (the software is essentially hardware independent). ZICE-II facilitates symbolic debugging of microprocessor programs, as well as support for all the features of ZAX's ICD-series emulators. Once installed, ZICE-II may be used in one of two different operating modes: REMOTE and LOCAL. In the REMOTE mode, the computer (and ZICE-II) acts as the interface between the user and the ICD. In the LOCAL mode, the user accesses the ICD directly via a terminal. The computer's role, in the LOCAL Mode, allows the user to access ZICE-II commands, perform symbolic debug, and interface to multi-user workstations.

ZICE-II Features

- Support for MS-DOS (3.1), VMS and Unix 4.2BSD operating systems
- Enter multiple commands on a single line (up to 10)
- Repeat the last command executed with a single keystroke
- Execute batch files upon invocation of ZICE-II
- Abort ICD commands or batch file commands at any time
- Calculate Hex or decimal numeric or symbol values
- Access an on-line help facility for ZICE-II and ICD commands
- Execute a command or series of commands with a single keystroke
- Record on disk all or selected parts of a debug session
- Create an unlimited number of user-defined macros
- Perform automatic command sequencing following an ICD break
- Insert comments into a batch file
- Dictate full file specifications for all file operations
- Automatically install selected macros
- Powerful module/symbol table manager
- Default file typing employed for all file operations
• Nested batch files
• User-definable, variable length module and symbol names
• Execution of operating system commands from within ZICE-II
• LOCAL "host computer assisted" mode
• Maintains symbol table in the host computer

User's executable program allow the following formats:
• INTEL hex (plus extended hex and ISIS symbol tables), MOTOROLA S records, INTEL 8086 OMF

ZICE-II supports all the features of ZAX ICD-series emulators, including:
• Single step trace
• RS-232 communications
• Universal command structure
• External break and event triggers
• In-line assembler and disassembler
• Real-time emulation (no wait states)
• Hardware and software breakpoints
• Real-time trace buffer
**Command Overview**

**BATCH**
The BATCH command executes a group of commands from a command line. BATCH files may be nested to a total of 10 levels. When a BATCH file is being executed, the ZICE-II prompt assumes the identity of the BATCH filename, thus indicating the current BATCH file being executed. The current BATCH file may be aborted by pressing control-X.

**CALCULATE**
The CALCULATE command allows hex or decimal calculation of numeric or symbol values.

**DEFINE**
The DEFINE command creates new module/symbol definitions, and alteration of existing module/symbol definitions.

**DELETE**
The DELETE command deletes single/multiple symbols.

**DISPLAY**
The DISPLAY command enables/disables display of symbols.

**EXECUTE**
The EXECUTE command allows execution of an operating system command from within ZICE-II environment.

**FUNCTION KEY**
The FUNCTION KEY command allows use of a previously defined function KEY macro to be used from within a BATCH file.

**HELP**
The HELP command provides an on-line summary for ZAX and ZICE-II commands, and provides on-line syntax and examples for ZAX and ZICE-II commands.

**IF**
The IF command allows for conditional execution of commands dependent upon specific register, memory or ports contents.

**JOURNAL/NOJOURNAL**
The JOURNAL/NOJOURNAL command allows command sequences to be recorded to disk file for later re-execution as a BATCH file.

**KEY**
The KEY command allows a command or series of commands to be associated with a single function key (F1-F10).

**LOG/NOLOG**
The LOG/NOLOG command allows all or selected parts of a debug session to be recorded to disk file.

**MACRO**
The MACRO command allows unlimited user-defined macros which can be locally created, and loaded/saved from/to a disk file.
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODULE LENGTH</td>
<td>The MODULE LENGTH command allows variation of the number of module-name characters to be used for output (0-20).</td>
</tr>
<tr>
<td>ONBREAK</td>
<td>The ONBREAK command allows automatic command sequencing following an emulation break.</td>
</tr>
<tr>
<td>PAUSE</td>
<td>The PAUSE command temporarily suspends the execution of a BATCH file.</td>
</tr>
<tr>
<td>PROMPT</td>
<td>The PROMPT command alters the ZICE-II prompt.</td>
</tr>
<tr>
<td>QUIT</td>
<td>The QUIT command terminates ZICE-II and returns to the operating system.</td>
</tr>
<tr>
<td>REMARK</td>
<td>The REMARK command allows comments to be inserted in BATCH files.</td>
</tr>
<tr>
<td>SAVE SYMBOL</td>
<td>The SAVE SYMBOL command allows the entire module/symbol table to be stored on disk.</td>
</tr>
<tr>
<td>SHELL</td>
<td>The SHELL command allows another operating system command interpreter (shell) to be run while preserving all symbols and the ZICE-II environment.</td>
</tr>
<tr>
<td>SHOW</td>
<td>The SHOW command displays all modules and symbols, just modules, just symbols, symbols from a specific module, and symbols with a common name.</td>
</tr>
<tr>
<td>SYMBOL LENGTH</td>
<td>The SYMBOL LENGTH command allows variation of the number of symbol-name characters to be used for output (0-20).</td>
</tr>
</tbody>
</table>
Before invoking ZICE-II, you must determine the role of the computer in your system configuration, and how you intend to control the ICD. In the REMOTE mode, the computer controls the ICD directly; no other devices are required. In the LOCAL mode, a terminal controls the ICD directly, while the computer acts as a conduit to ZICE-II and permits interfacing to multiuser workstations. You must select and construct your particular system configuration before installing ZICE-II.

Operation Mode: REMOTE

Operation Mode: LOCAL

NOTE: To see how to configure your system for either REMOTE or LOCAL operation, read Section 1, "ICD Description and Operation," in your ICD User's Manual.
ZICE-II may be invoked on any computer using MS-DOS, VMS or Unix 4.2BSD. Before invoking ZICE-II, it must be properly installed on your particular system. To install ZICE-II, determine which operating system your computer employs and then read the instructions under that heading (e.g., for Unix OS, read both "ZICE-II Specifics For Unix Environment;" and "Invoking ZICE-II In Unix Environment").

Before invoking ZICE-II in MS-DOS environment, make a directory where you intend the ZICE-II file to reside, and then copy ZICE-II to that directory.

REMOTE Mode Invocation

In order to invoke ZICE-II in the REMOTE mode, enter the following command:

    zice

LOCAL Mode Invocation

In order to invoke ZICE-II in the LOCAL mode, enter the following command:

    hinstal.dat

and then follow the instructions on the computer's screen.

For VMS, ZICE-II uses a directory that the installation program creates. This directory is "sys$sysroot: [zax.zicexxx1:]", where 'xxx' represents the type of ICD used (e.g., "68k" for the 68000 family of ICDs). Within this directory reside the "zice.hlp" (help) and "zice.sys" (system) files. ZICE-II also maintains an environment variable ("ZAX_ZICE") which points to the "sys$root: [zax.-zicexxx]" directory.

Moving Distribution to Your Computer

Before placing ZICE-II on your computer, you must copy the distribution to any directory on your computer. The media that you are using is in "BACKUP" format, and can be copied using the VMS "BACKUP" command. The following is an example of the command used to transfer distribution to your computer:

    MOUNT/FOREIGN msa0:
    BACKUP/VERIFY/REWIND nsa0:zice.blk/save[]

This command copies the files on the media that is associated with the magnetic tape device "msa0:" into your current directory.
Installation

To install ZICE-II on your computer system, you must have sufficient privileges and your current directory must be where the executable files reside. The installation is automatically performed by invoking the ZAX installation utility. To invoke, use the following command:

@zinstal

This utility creates the "sys$sysroot: [zax.zicexxx]" directory and then moves the system and help files there. The executable files are then placed in the "sys$sysroot: [zax.zicexxx]" directory. These files are then removed from your current directory.

REMOTE Mode Invocation

In order to use ZICE-II in the REMOTE mode, you must specify which terminal port the ICD is attached to. For example, to invoke ZICE-II in the REMOTE mode with the ICD attached to "txal:" you would use the following command:

z68k -t txal:

If your ICD is configured in the REMOTE mode and you wish ZICE-II to execute a batch file, you must append the batch file name to the command. The following is an example using 68000 ZICE-II software:

z68k -t txal: batch_file.cmd

LOCAL Mode Invocation

The following is an example of invoking 68000 ZICE-II software in the LOCAL mode:

z68k

This command starts ZICE-II and then requires that you follow the instructions that will be issued to you. If you wish to execute a batch file when ZICE-II is invoked, then the batch file name must be appended to the command. The following is an example of invoking ZICE-II and executing a batch file while in the LOCAL mode:

z68k batch_file.cmd
For Unix, ZICE-II uses two directories on the host computer. The directory where executable files will reside is called "/usr/bin:" These executable files are called "zice" and "zxxx" (where 'xxx' represents the type of ICD—e.g., "68k" for the 68000 family of ICDs). The other directory, "/user/zax/zicexxx:" is the one that the installation program creates. Within this directory reside the "zice.hlp" (help) and "zice.sys" (system) files. ZICE-II also maintains an environment variable ("ZAX_ZICE") which points to the "/usr/zax/zicexxxx:" directory.

If you have purchased a source distribution, you will need to create the ZICE-II executable files on your host computer. (This is not necessary if you have only purchased the executable distribution.)

Moving Distribution to Your Computer

Before placing ZICE-II on your computer, you must copy the distribution to any directory on your computer. The media that you are using is in "tar" format, and can be copied using the Unix "tar" command. The following is an example of the command used to transfer a distribution to your computer:

```
tar -xvf /dev/rmt8
```

This command copies the files on the media that is associated with the device "/dev/rmt8:" into your current working directory.

Creating Executable ZICE-II

This is the next step if you have purchased a source distribution. To create the ZICE-II executable files, you must use the Unix "make" utility. Make sure that your current directory is where the ZICE-II source files reside and then use the following Unix command:

```
make
```

This command creates all the necessary executable files for ZICE-II to be used on your computer.
Installation

To install ZICE-II on your computer system, you must have sufficient privileges and your current directory must be where the executable files reside. The installation is automatically performed by invoking the ZAX installation utility. To invoke, use the following command:

```
zaxinstall
```

This utility creates the "/usr/zax/zicexxx" directory and then moves the system and help files there. The executable files are then placed in the "/usr/bin" directory. These files are then removed from your current directory.

REMOTE Mode Invocation

In order to use ZICE-II in the REMOTE mode, you must specify which terminal port the ICD is attached to. For example, to invoke ZICE-II in the REMOTE mode with the ICD attached to "ttydl," you would use the following command:

```
z68k -t /dev/ttydl
```

If your ICD is configured in the REMOTE mode and you wish ZICE-II to execute a batch file, you must append the batch file name to the command. The following is an example using 68000 ZICE-II software:

```
z68k -t /dev/ttydl batch_file.cmd
```

LOCAL Mode Invocation

The following is an example of invoking 68000 ZICE-II software in the LOCAL mode:

```
z68k
```

This command starts ZICE-II and then requires that you follow the instructions that will be issued to you. If you wish to execute a batch file when ZICE-II is invoked, then the batch file name must be appended to the command. The following is an example of invoking ZICE-II and executing a batch file while in the LOCAL mode,

```
z68k batch_file.cmd
```
The following shows the actions that transpire after control is passed to the ZICE-II program.

1. The command line is checked for the presence of a \(-t\) switch, followed by the computer's serial interface port name, to indicate a change from the default REMOTE or LOCAL mode of operation.

2. Access to files outside the current directory are searched through the host environment variable, "PATH."

3. The control-c interrupt vector is managed by ZICE-II.

4. The first line of the SIGN-ON text is displayed.

5. The ZICE.SYS file is read, and the PATH is searched if the file is not found in the current directory. If ZICE.SYS is not found, ZICE-II aborts.

6. If the host computer is an IBM PC or equivalent, the second line of the ZICE.SYS message is used to initialize the COM1 or COM2 port with the specified parameters.

NOTES: (a) max baud rate allowed is 19200bps.
(b) The original port parameters are saved, and re-established when ZICE-II exits.

7. The next two lines of the SIGN-ON message are displayed.

8. If the host computer is an IBM PC or equivalent, the specified port name and speed are displayed.

9. The macro file ZICE.MAC is searched for, if necessary using the PATH definition. If ZICE.MAC is found, the macros contained therein are loaded into ZICE-II's macro table.

10. If LOCAL operation is desired, the EXIT from USER mode is displayed.

11. The serial port(s) to be used are enabled.

NOTE: COM1/COM2 interrupts are enabled on the IBM PC.

12. ZICE-II now waits for communication from the ICD. When it is established, the ZICE-II prompt is displayed.
13. If the invocation command line included a filename parameter, the file is opened for immediate batch processing.

14. When ZICE-II receives the QUIT command, any open JOURNAL or LOG files are closed, and any interrupts which have been managed by ZICE-II are returned to their original values before returning control to the operating system.

**Special Keys**

The following keys are reserved for ZICE-II:

<table>
<thead>
<tr>
<th>Keys</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl (control)-A</td>
<td>repeats last command</td>
</tr>
<tr>
<td>Ctrl-X</td>
<td>aborts current batch file</td>
</tr>
<tr>
<td>Ctrl-Y*</td>
<td>leaves ICD running and loads a new operating system shell while preserving ZICE-II environment</td>
</tr>
<tr>
<td>Ctrl-Z*</td>
<td>leaves ICD running and quits ZICE-II</td>
</tr>
<tr>
<td>space bar</td>
<td>controls flow of screen output</td>
</tr>
<tr>
<td>ESC (escape)</td>
<td>aborts current command</td>
</tr>
</tbody>
</table>

*Only available after a GO command has been issued.*
**BATCH**

**Abbreviation**  
BA

**Action**  
Allows user to execute a series of commands by grouping the commands together in a command file. The BATCH command may be nested to a level of 10. Default file extension is CMD.

**Syntax**  
BA filename(.cmd)

**Example**  
BA setup  
BA test.1

---

**CALCULATION**

**Abbreviation**  
CAL

**Action**  
Allows hex or decimal calculation of numeric or symbol values.

**Syntax**  
C data +|- data

**Example**  
C 12345678  
C 0fffh-44h

---

**DEFINE**

**Abbreviation**  
DEF

**Action**  
Allows creation of new module/symbol definitions or alters existing module/symbol definitions.

**Syntax**  
DEF [module.]symbol = value  
DEF [module.]symbol = segment:offset

**Example**  
DEF LAB1 = 1234  
DEF INIT.START = 1000h

---

**DELETE**

**Abbreviation**  
DEL

**Action**  
The DELETE command deletes a symbol or group of symbols from the symbol table.

**Syntax**  
DEL module.symbol  
DEL symbol  
DEL *.symbol  
DEL module

**Example**  
DEL LAB1  
DEL INIT* (deletes all symbols from module INIT)  
DEL *.ABC (deletes all symbols called ABC)
**DISPLAY**

**Abbreviation**  DISP
**Action**       Enables/Disables display of symbols.
**Syntax**       DISP
                 DISP ON/OFF
**Example**      DISP OFF
                 DISP

**EXECUTE**

**Abbreviation**  EXEC
**Action**       Allows execution of a DOS command from within ZICE-II environment
**Syntax**       EXEC command_string
**Example**      EXEC DIR C:
                 EXEC typo demo.lst

**FUNCTION KEY**

**Abbreviation**  FN
**Action**       Allows the use of a previously defined function key to be used from within a BATCH file.
**Syntax**       FN
                 FN 1 | 2 | 3... | 10
**Example**      FN 5

**HELP**

**Abbreviation**  HE
**Action**       Provides an on-line summary and syntax listing for ICD and ZICE-II commands.
**Syntax**       HE [command]
**Example**      HE
                 HE FILL
                 HE A
### IF

**Abbreviation**
none

**Action**
Allows conditional execution of commands dependent upon specific register, memory or port contents. The IF command may be nested to a maximum of 10 levels.

**Syntax**
```plaintext
IF reg(n) | mem(n) | port(n) | eq | ne | lt | gt | le | ge value
commands1
[else]
commands2
endif
```

**Example**
```plaintext
IF mem (.flag) gt 80
  lo test4
  g 100
ELSE
  lo test5
  g200
ENDIF
```

### JOURNAL

**Abbreviation**
J

**Action**
Opens a file for storing all subsequent commands, until a NOJOURNAL command is issued. (This command is a convenient way of creating a BATCH file).

**Syntax**
```plaintext
J filename[.cmd]
```

**Example**
```plaintext
J TEST
J TESTA.XYZ
```

### KEY

**Abbreviation**
K

**Action**
Allows a command or series of commands to be associated with a single function key (F1-F10).

**Syntax**
```plaintext
K 1 | 2 | 3... | 10 = command_string
```

**Example**
```plaintext
KEY 3 = H D 100,50
KEY 7 = "R; DI 0 10:G MAINLOOP"
```
LOG
Abbreviation: none
Action: Opens a file which is used to store all subsequent user commands and ICD output for later processing or report generation, etc. NOLOG is used to terminate the logging process.
Syntax: LOG filename([log])
Example: LOG TESTLOG
LOG LOGTXT

MACRO
Abbreviation: MAC
Action: Allows creation of unlimited user-defined commands. The MACRO command prompts for command lines until a blank line is read. The defined MACRO will accept up to 10 parameters (named: ..). Macros can be nested to a level of 10.
Macro support commands are:
MDelete (delete macro)  e.g., MD reset
MLoad (load macro files)  e.g., ML macros
MSave (save macros to file)  e.g., MS newmacs
MShow (show defined macros)  e.g., MSH [macro_name]
Syntax: MAC macro_name
Example: MAC reset

MODULE LENGTH
Abbreviation: MOD
Action: Sets the length of module names to be used on screen output.
Syntax: MOD MOD length
Example: MOD 10
MOD
## NOJOURNAL

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Action</th>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOJ</td>
<td>Stops command journaling.</td>
<td>NOJ</td>
<td>NOJ</td>
</tr>
</tbody>
</table>

## NOLOG

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Action</th>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOL</td>
<td>Stops transaction Logging.</td>
<td>NOL</td>
<td>NOL</td>
</tr>
</tbody>
</table>

## ONBREAK

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Action</th>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Allows automatic command sequencing following an emulation break. For any given break condition (breakpoint, bus timeout, memory timeout, etc.), the ICD can be programmed to perform any function on breakpoint.</td>
<td>ON/A /B /C command_string ON/A /B /C ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

## PAUSE

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Action</th>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>Temporarily suspends execution of a BATCH file until a key is pressed. If control-X is pressed, the BATCH file will be aborted.</td>
<td>PA</td>
<td>PA</td>
</tr>
<tr>
<td><strong>PROMPT</strong></td>
<td>Abbreviation</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Allows alteration of the ZICE-II prompt. When executing a BATCH file, the prompt automatically takes on the BATCH filename.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syntax</td>
<td>PRO string</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>PRO DEMO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QUIT</strong></th>
<th>Abbreviation</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Terminates ZICE-II and returns to DOS.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>REMARK</strong></th>
<th>Abbreviation</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Allows comments to be inserted in BATCH files.</td>
<td></td>
</tr>
<tr>
<td>Syntax</td>
<td>REM text</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>REM This is a comment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SAVE SYMBOL</strong></th>
<th>Abbreviation</th>
<th>SAVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Allows the entire module/symbol table to be stored on disk.</td>
<td></td>
</tr>
<tr>
<td>Syntax</td>
<td>SAVES filename[sym]</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>SAVES iotest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAVES symbols_abs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SHELL</strong></th>
<th>Abbreviation</th>
<th>SHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Allows another system command interpreter (shell) to be run while preserving all symbols, and the ZICE-II environment. Return to ZICE-II by pressing the &quot;EXIT&quot; key.</td>
<td></td>
</tr>
<tr>
<td>Syntax</td>
<td>SHE</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>SHE</td>
<td></td>
</tr>
</tbody>
</table>
SHOW

Abbreviation: SH
Action: Displays various symbol formats.

Syntax:
- SH [ALL]
- SH SYM|MOD
- SH module_name*
- SH *symbol_name
- SH module_name.c*
- SH c*

Example:
- SH
- SH *start
- SH MOD
- SH D*

SYMBOL LENGTH

Abbreviation: SYM
Action: Allows a variation of the number of symbol-name characters to be used for output.

Syntax:
- SYM
- SYM length

Example:
- SYM 10
- SYM
COMMAND SUMMARY

BATCH
BA filename(.cmd)

CALCULATION
C data + | - data

DEFINE
DEF [module.]symbol = value
DEF [module.]symbol = segment:offset

DELETE
DEL module:symbol
DEL symbol
DEL *symbol
DEL module

DISPLAY
DISP
DISP ON | OFF

EXECUTE
EXEC command_string

FUNCTION KEY
FN
FN 1 | 2 | 3 .. | 10

HELP
HE [command]

IF
IF reg (n) | mem(n) | port(n) eq | ne | lt | gt | le | ge value
commands1
[else]
    commands2
endif

JOURNAL
J filename(.cmd)

KEY
K
K 1 | 2 | 3... | 10 = command_string

LOG
LOG filename(.log]

MACRO
MAC macro_name

MODULE LENGTH
MOD
MOD length

NOJOURNAL
NOJ

NOLOG
NOL

ONBREAK
ON/A | B | C command_string
ON/A | B | C ON | OFF | CLR
ON/O | 1 | 2 . . . | 7 command_string
ON/O | 1 | 2 . . . | 7 ON | OFF | CLR
ON/E | W | M | G | X | U | F | T command_string
ON/E | W | M | G | X | U | F | T ON | OFF | CLR

PAUSE
PA

PROMPT
PRO string

QUIT
Q

REMARK
REM text

SAVE SYMBOL
SAVES filename[sym]

SHELL
SHE

SHOW
SH [ALL]
SH SYM | MOD
SH module_name.*
SH *symbol_name
SH module_name.c*
SH c*

SYMBOL LENGTH
SYM
SYM length

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