APPENDIX A

FUNCTIONAL COMMAND LIST

Command	Description	Page
Setting break points :		
BPM	Set break point on memory access or execution	54
BPR	Set break point on memory range	57
BPIO	Set break point on I/O port access	59
BPINT	Set break point on interrupt	61
BPX	Set/clear break point on execution	63
CSIP	Set CS:IP range qualifier	64
BPAND	Wait for multiple break points to occur	65
Manipulating break points :		
BD	Disable break points	68
BE	Enable break points	69
BL	List break points	70
BPE	Edit break point	71
BPT	Use break point as a template	72
BC	Clear break points	73
Display and edit commands:		
U	Unassemble instructions	77
R	Display or change register	79
MAP	Display system memory map	81
D	Display memory	83
E	Edit memory	84
INT?	Display last interrupt number	86
? or H	Display help information	87
VER	Display Soft-ICE version number	88
I/O port commands:		
I	Input from I/O port	90
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Command	Description	Page
Transfer control commands:		
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G	Go to address	94
T	Trace one instruction	95
P	Program step	96

HERE Go to current cursor line 97
GENINT Force an interrupt 98
EXIT Force exit of current DOS program 99
BOOT System boot (retain Soft-ICE) 101
HBOOT Hard system boot (total reset) 102

Debug mode commands:
ACTION Set action after break point is reached 104
W Set DOS/ROM BIOS re-entrancy warning mode 106
BREAK Break out any time 107
13HERE Direct Interrupt 3's to Soft-ICE 108

Utility commands :
A Assemble code 110
S Search for data 112
F Fill memory with data 113
M Move data 114
C Compare two data blocks 115

Specialized Debugging Commands:
SHOW Display instructions from history buffer 117
TRACE Enter trace simulation mode 119
XT Single step in trace simulation mode 121
XP Program step in trace simulation mode 122
XG Go to address in trace simulation mode 123
XRSET Resets back trace history buffer 124
VECS Save/restore/compare interrupt vectors 125
SNAP Take snap shot of memory block 127
EMMMAP Display EMM allocation map 129

Command Description Page

Windowing Commands:
WR Toggle register window 131
WC Toggle/set size of code window 132
WD Toggle/set size of data window 133
EC Enter/exit code window 134
. Locate current instruction 136

Debugger Customization Commands:
PAUSE Pause after each screen 138
ALTKEY Set alternate key sequence to invoke Soft-ICE 139

FKEY Show and edit function keys 141
BASE Set/display current radix 144
CTPP Toggle log session to printer 145
Print-Screen Print contents of screen 146
PRN Set printer output port 147

Screen Control Commands :
FLASH Restore screen during P and T 149
FLICK Screen flicker reduction 150
WATCHV Set watch video mode 152
RS Restore program screen 153
CLS Clear window 154
ALTSCR Change to alternate screen 155
WIN Change size of Soft-ICE window 156

Symbol and Source Line Commands:
SYM Display/set symbol 159
SYMLOC Relocate symbol base 161
SRC Toggle between source, mixed and code 162
FILE Change/display current source file 163
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APPENDIX B

ALPHABETIC COMMAND LIST

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. Locate current instruction 136
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A Assemble code 110
ACTION Set action after break point is reached 104
ALTKEY Set alternate key sequence to invoke Soft-ICE 139
ALTSCR Change to alternate screen 155
BASE Set/display current radix 144
BC Clear break points 73
BD Disable break points 68
BE Enable break points 69
BL List break points 70
BOOT System boot (retain Soft-ICE) 101

BPAND	Wait for multiple break points to occur	65
BPE	Edit break point	71
BPINT	Set break point on interrupt	61
BPIO	Set break point on I/O port access	59
BPM	Set break point on memory access or execution	54
BPR	Set break point on memory range	57
BPT	Use break point as a template	72
BPX	Set/clear break point on execution	63
BREAK	Break out any time	107
C	Compare two data blocks	115
CLS	Clear window	154
CSIP	Set CS:IP range qualifier	64
CTRL-P	Toggle log session to printer	145
D	Display memory	83
E	Edit memory	84
EC	Enter/exit code window	134
EMMMAP	Display EMM allocation map	129
EXIT	Force exit of current DOS program	99
F	Fill memory with data	113
FILE	Change/display current source file	163

Command	Description	Page
FKEY	Show and edit function keys	141
FLASH	Restore screen during P and T	149
FLICK	Screen flicker reduction	150
G	Go to address	94
GENINT	Force an interrupt	98
HBOOT	Hard system boot (total reset)	102
HERE	Go to current cursor line	97
I	Input from I/O port	90
13HERE	Direct Interrupt 3's to Soft-ICE	108
INT?	Display last interrupt number	86
M	Move data	114
MAP	Display system memory map	81
O	Output to I/O port	91
P	Program step	96
PAUSE	Pause after each screen	138
Print-Screen	Print contents of screen	146
PRN	Set printer output port	147
R	Display or change register	79
RS	Restore program screen	153
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SNAP Take snap shot of memory block 127
SRC Toggle between source, mixed and code 162
SS Search current source file for string 164
SYM Display/set symbol 159
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T Trace one instruction 95
TRACE Enter trace simulation mode 119
U Unassemble instructions 77
VECS Save/restore/compare interrupt vectors 125
VER Display Soft-ICE version number 88
WARN Set DOS/ROM BIOS re-entrancy warning mode 106
WATCHV Set watch video mode 152
WC Toggle/set size of code window 132
WD Toggle/set size of data window 133
WIN Change size of Soft-ICE window 156

WR Toggle register window

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X Exit from Soft-ICE window 93
XG Go to address in trace simulation mode 123
XP Program step in trace simulation mode 122
XRSET Reset back trace history buffer 124
XT Single step in trace simulation mode 121

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APPENDIX C

KEYSTROKE FUNCTION LIST

Keystroke	Description
Moving the Soft-ICE window:	
CTRL ↑	Move window one row up
CTRL ↓	Move window one row down
CTRL →	Move window one row right
CTRL ←	Move window one row left

Resizing the Soft-ICE window:

ALT ↑	Expand the window
CTRL ↓	Shrink the window

Editing the Command Line:

→	Move the cursor to the right
←	Move the cursor to the left
INS	Toggle insert mode
DEL	Delete current character
HOME	Move cursor to the start of the line
END	Move cursor to the end of the line
↑	Display the previous command
↓	Display the next command
SHIFT ↑	Scroll one line up in display
SHIFT ↓	Scroll one line down in display
PAGE UP	Scroll one page up in display
PAGE DN	Scroll one page down in display
BKSP	Delete previous character
ESC	Cancel current command

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APPENDIX D

Error Messages and Descriptions

This appendix lists and explains the error messages that can be generated by Soft-ICE.

A General Protection Violation Has Occurred. This is typically caused by a protected mode instruction.
CS:IP = XXXX:XXXX
Type 'C' to Continue
Type 'R' to Return to Soft-ICE.

This message can occur either when an 80386 protected mode instruction is encountered or if there is a segment wrap-around condition. You can often determine the reason for this message by un-assembling the instruction at the specified address. If the first byte of the instruction is an 0FH, then it is probably a protected mode instruction. If the

instruction is accessing a word at offset 0FFFFH in a segment then it is a segment wrap problem. If you type C to continue, then control is given to the interrupt 0 handler in the DOS virtual machine.

This message often occurs when a program jumps to an address that does not contain valid code or when valid code has been overwritten.

Attempt To Divide By 0

This message is displayed when Soft-ICE evaluates an expression and the divisor in a divide operation is zero.

BPM Break Point Limit Exceeded

Soft-ICE allows a maximum of 4 memory break points. This message is displayed ifyou attempt to exceed the maximum limit.

Break Point Table Full

Soft-ICE allows a maximum of 16 break points. This message is displayed if you attempt to exceed the maximum limit.

Count Too Large

The Soft-ICE break point commands allow an optional count field. This field can contain a maximum value of FFH. This error message is displayed if the count value specified is greater than FFH.

DOS Memory Structures Corrupted

This message is displayed if Soft-ICE detects a problem with the DOS memory block chain when using the MAP command. This message can also occur if you use the MAP command with a non-DOS operating system.

Duplicate Break Point

When a break point is entered, Soft-ICE compares the break point conditions with those of break points that

had been set previously. If the conditions match, this message is displayed.

Interrupt Break Point Limit Exceeded

Soft-ICE allows a maximum of 10 interrupt break points. This message is displayed if you attempt to exceed the maximum limit.

Invalid Opcode Has Occurred
CS:IP =XXXX:XXXX
Type 'C' to Continue
Type 'R' to Return to Soft-ICE.

When the 80386 encounters an instruction that is illegal, it generates an interrupt 6. Soft-ICE displays this message and gives you the opportunity to continue or to return to Soft-ICE. If you type C to continue, then control is given to the interrupt 6 handler in the DOS virtual machine.
This message often occurs when a program jumps to an address that does not contain valid code or when valid code has been overwritten.

I/O Break Point Limit Exceeded

Soft-ICE allows a maximum of 10 I/O break points. This message is displayed if you attempt to exceed the maximum limit.

No Alternate Screen

This message is displayed if the ALTSCR command is used and Soft-ICE detects only one video adapter.

Parameter is Wrong Size

Certain fields require a specific data type size (byte, word or double word). This message is displayed if the

data type size is exceeded. For example, if you use the command 'BPMB 2000:2000 EQ 1234' you are asking

Soft-ICE to look for a byte access at location 2000:2000 with a value of 1234H. Since 1234H is larger than a byte, the command causes this error message to occur.

Parameters Required

Most Soft-ICE commands require one or more parameters. If a command is entered without the required number of parameters, this message is displayed.

Range Break Point Limit Exceeded

Soft-ICE allows a maximum of 10 memory range break points. This message is displayed if you attempt to exceed the maximum limit.

Second Parameter Must Be Greater than First

When specifying a memory range, the first number entered must be the lower limit of the range, otherwise this message is displayed.

Segment:Offset Can Not Wrap

Most Soft-ICE commands do not allow a memory pointer (segment:offset) to wrap from high memory to low. For example, the memory pointer FFFF:FFFF wraps and is illegal. This message is displayed if you attempt to wrap from high memory to low.

Soft-ICE cannot be loaded.
Needs to load at top of memory.
Load before any TSR's or control programs.

Soft-ICE needs to load itself at the highest memory location possible. This memory is then 'mapped out', making it invisible to DOS programs, so they can't crash Soft-ICE. This message is displayed if Soft-ICE detects that another program has already been loaded at the top of memory.

Soft-ICE cannot run with other 80386 control programs

The 80386 only allows ore protected mode program a time, so Soft-ICE can not coexist with other control programs. When debugging a program that use EMS and EEMS, you could get this error message when you try to load Soft-ICE, because some 80386 systems come with a control program that uses the 80386 paging system to give you EMS and EEMS with a board that only has extended memory. You can, however, use a true expanded memory board to debug programs that use EMS and EEMS.

Soft-ICE has already been loaded

This message occurs if you attempt to load Soft-ICE twice.

Soft-ICE has not been loaded

This message occurs if you attempt to unload Soft-ICE when it has not yet been loaded.

Soft-ICE loads at the top of extended memory. This may conflict with other programs that use extended memory. If you are sure it will not conflict, then answer 'Y', otherwise answer 'N' and refer to the chapter on loading Soft-ICE with extended memory.

This message occurs if you attempt to load Soft-ICE into extended memory, and S-ICE.SYS was not loaded in your CONFIG.SYS file. This warning is given to insure that you do not unintentionally wipe out a virtual disk or another program that may be loaded in extended memory. For more information, refer to section 2.2, "Loading Soft-ICE" and chapter 6, "Initialization Options".

Soft-ICE will only run on 80386 based machines

Soft-ICE requires Intel's 80386 microprocessor.

Syntax Error

This message is displayed if the information that was entered did not fit within the structure of any Soft-ICE command.

The P & G Commands Function In RAM Only

Soft-ICE uses two methods to implement the P and G commands. The first method uses the 80386 break point registers. However, if you have already set 4 BPM-style break points, Soft-ICE uses the INT 3 method, which will only work in RAM. If you attempt to use the P or G commands in ROM at this point, Soft-ICE detects this condition and displays this error message.

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Valid Verbs are R, W, RW, X

This message is displayed if an invalid verb is specified in a BPM command. When using the BPM command, the valid choices for verbs are R(read), W(write), RW(read/write), and X(execute).

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APPENDIX E

TROUBLESHOOTING GUIDE

This appendix gives solutions to some possible problems that you could encounter when using Soft-ICE. If you do not find the problem here, check the README.SI file on your distribution diskette for any troubleshooting hints that may not have made it into this manual.

Time does not show the correct time at the end of the day.

Soft-ICE does not let any interrupts go through to the system when the Soft-ICE window is up. This does not affect the real time clock at all, so the next time you reboot, the time will be displayed correctly again. You can also correct the time by running the program UPTIME. This gets the time from the real time clock and calls DOS to set the time.

When debugging a program that uses EMS and EEMS, you get this error message when

you try to load Soft-ICE "Soft-ICE cannot run with other 80386 control programs".

Some 386 systems come with a control program that uses the 80386 paging system to give you EMS and EEMS with a board that only has extended memory. The 386 only allows one control program at a time, so Soft-ICE can not coexist with these control programs. You can, however, use a true expanded memory board to debug programs that use EMS and EEMS.

Soft-ICE does not cause your software debugger to break.

Some software debuggers will break only when used with one type of debugging interrupt. Refer to the ACTION command in section 5.4. This lists three different types of standard action that can be taken

when a break point happens. Try all three. Different ones work better for different debuggers.

Soft-ICE does not come up when your monitor is in graphics mode, or it does not restore your graphics screen correctly.

Soft-ICE does not use the ROM BIOS for its output, it must go directly to the hardware. Soft-ICE was designed to work with the following types of controllers, or ones that are 100% compatible:

- CGA
- MDA
- Hercules
- EGA
- VGA

If your controller is not one of these, or not 100% compatible, you can use a second controller and monitor, and use the ALTSCR command described in section 5.9.

The key sequence used to bring up Soft-ICE conflicts with an existing program that you are running.

You can set a different key sequence to bring up Soft-ICE by using the ALTKEY command. If this doesn't work, add the SHIFT key to the current key

sequence and use this new key sequence to bring up the existing program. Soft-ICE will not respond to the new key sequence, and will allow it to go through to the existing program. Refer to the ALTKEY command in section 5.8.

When your program crashes, Soft-ICE will not come up.

Refer to the BREAK command in section 5.4. This command allows you to pop up the SoFt-ICE window when the system is hung with interrupts disabled.

After your break point triggers your debugger, your debugger does not respond.

There are two possible reasons why this problem could occur:

1) Your debugger has caused DOS or ROM BIOS to be re-entered. DOS and ROM BIOS are not fully re-entrant, so your debugger may not work correctly. Use the WARN command to turn re-entrancy warning mode on. The next time DOS or ROM BIOS is about to be re-entered, a warning message will be displayed, and you will be able choose to return to Soft-ICE to avoid the problem Refer to the WARN command in section 5.4.
2) A break occurred in the middle of an interrupt routine. Some debuggers can not handle this occurrence. Use ACTION set to HERE, because Soft-ICE will allow you to break in the middle of an interrupt routine. Refer to the ACTION command in section 5.4.

You are using a CGA monitor and you get lots of flickering when Soft-ICE comes up.

Certain types of video cards will flicker if characters are output without waiting for horizontal or vertical retrace. To reduce the flickering, turn FLICK mode ON. Refer to the FLICK command in section 5.9.

When you use the BOOT command, the system starts to reboot but then hangs.

Soft-ICE uses the interrupt 19 method of soft-booting. There are two possible times when this method could fail:

1) On a freshly booted system this method will work fine. But if the system has been corrupted by an errant program, there is a chance that this method will not work.
2) Some programs that use extended or expanded memory, such as EMS drivers or disk caches, are not able to handle an interrupt 19 style boot. When debugging device drivers and boot loaders that have this problem, you should use the following method. Boot the system without the drivers that cause the problem; load Soft-ICE; set up the drivers to load on the next boot; and then use the BOOT command. Refer to the BOOT command in section 5.3.

You just used the SYSREQ key sequence to bring up Soft-ICE, and your system appears to be hung, or it begins to dump the screen to your printer.

On some keyboards, you must press the ALT key and the PrtSc key simultaneously to generate a system request. If you accidentally press only the PrtSc key, the system will attempt to print your screen. If no printer is attached, your system will appear to be hung. To avoid this problem, be careful to press both keys simultaneously, or use the ALTKEY command to change to a different key sequence. Refer to the ALTKEY command in section 5.8.

You were unassembling instructions, or editing or displaying memory when your debugger crashed.

You accessed an address that triggered a Soft-ICE break point, and ACTION was not set to HERE. When Soft-ICE brings you to the point where you want to look around in memory with your debugger, you should disable the Soft-ICE break points. If you don't you could set off a break point unintentionally. This

would cause your debugger to trigger itself, which can be a fatal problem with debuggers that cannot be re-entrant.

After you exited from your debugger, the system crashed.

This problem of course could have many causes, but one possible cause is that you may have forgotten to disable the Soft-ICE break points, and ACTION is still set to trigger your debugger. When the break point occurs, ACTION will attempt to trigger your debugger, but your debugger is no longer loaded.

You set a break point to trap on Interrupt 15H, function 87H, 88H, or 89H, and the break point did not occur.

Soft-ICE processes these functions internally in protected mode, so you cannot set break points on these functions.

Your program does not accept keystrokes, but the keyboard is still active.

A shift state key may be logically stuck down. Try pressing and releasing each shift, control and alt key.

Soft-ICE does not restore your graphics display properly.

Soft-ICE has an enhanced video virtualization mode that can virtualize many special graphics modes. Turn this mode on by entering WATCHV ON. See the description of the WATCHV command for more details. For non-compatible video controllers and certain obscure modes you may have to use an alternate monitor. See the ALTSCR command.

The machine locks up while you are in Soft-ICE or moving the Soft-ICE window.

Soft-ICE has timing problems with some keyboards. Use the NOLEDS statement in S-ICE.DAT. This prevents Soft-ICE from sending LED commands to the keyboard.