SoftICE® Command Reference

Version 3.1

COMPUWARE®

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Preface

The *SoftICE Command Reference* explains the functionality of all SoftICE® commands. The various commands described in this reference operate on IA-32 hosts and targets with the following supported operating systems:

- Windows® 9x (including Windows 98 and Windows ME)
- Windows NT family (including Windows NT, Windows 2000, Windows XP, and Windows Server 2003)

Note: Some commands described in this reference may operate on older operating systems such as Windows 3.1 and Windows 95.

The commands are listed on the following pages in alphabetical order and contain the following information:

- Command Name
- Operating System
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For each command, this reference provides information on the proper syntax, available options, expected output, examples, and related commands, as applicable.

About Inline Editing

SoftICE Version 4.3.1 has the ability to do **Inline Editing** of variables displayed in either the Locals Window or the Watch Window.

Usage

1. Navigate to the variable you wish to edit in either the Locals Window (WL) or the Watch Window (WW).
2. Use the hotkey sequence, **ALT-E**, to launch Inline Editing.
3. Edit your data.
4. Press either the **Enter** key to store your changes, or the **Esc**ape key to abort your changes.

Navigation Keys

The following keys are available for the Inline Editing feature:

- **Enter -** Stores your modifications.
- **Esc**ape **-** Aborts any changes.
- **Left/Right Arrow -** Changes your position within the edit field. Additionally, pressing either of these keys puts you into editing's Overtype Mode.
- **Home -** Moves to the start of the field and additionally puts you into Overtype Mode.

Current Limitations

- Editing of strings, floats, and bit fields is not possible in this release.
- You must be in the Locals/Watch Window before typing **Alt-E**.
- The Inline Editing hotkey is ***not*** remappable.

Notes: All input is done in hex.

When you enter Inline Editing, you will be placed in Overtype Mode. This means that the information to the right of the edit field will be overwritten until you complete your edit. If you start typing in the edit field, the entire entry will be erased. This is the intended functionality.

SoftICE Commands

.

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Definition

Locate the current instruction in the Code window.

Syntax

.

Use

When the Code window is visible, the **. (Dot) command** makes the instruction at the current CS:EIP visible and highlights it.

For Windows 9x and Windows NT family

The command switches the context back to the original context in which SoftICE popped up.

?

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Evaluate an expression.

Syntax

For Windows 3.1

? [***command*** | ***expression***]

For Windows 9x and Windows NT family

? ***expression***

Use

For Windows 3.1

Under Windows 3.1, the parameter you supply to the **? command** determines whether help is displayed or an expression is evaluated. If you specify a command, ? displays detailed information about the command, including the command syntax and an example. If you specify an expression, the expression is evaluated, and the result is displayed in hexadecimal, decimal, signed decimal (only if < 0), and ASCII.

For Windows 9x and Windows NT family

Under Windows 9x and the Windows NT family, the ? command only evaluates expressions. (Refer to *H* on page 137 for information about getting help under Windows 9x and the Windows NT family.)

To evaluate an expression enter the ? command followed by the expression you want to evaluate. SoftICE displays the result in hexadecimal, decimal, signed decimal (only if < 0), and ASCII.

Example

The following command displays the hexadecimal, decimal, and ASCII representations of the value of the expression 10*4+3.

```
? 10*4+3
00000043 0000000067  "C"
```

See Also

H

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Assemble code.

Syntax

A [***address***]

Use

Use the SoftICE assembler to assemble instructions directly into memory. The assembler supports the standard Intel 80x86 instruction set.

If you do not specify the address, assembly occurs at the last address where instructions were assembled. If you have not entered the **A command** before and did not specify the address, the current CS:EIP address is used.

The A command enters the SoftICE interactive assembler. An address displays as a prompt for each assembly line. After you type an assembly language instruction and press Enter, the instructions assemble into memory at the specified address. Type instructions in the standard Intel format. To exit assembler mode, press Enter at an address prompt.

If the address range in which you are assembling instructions is visible in the Code window, the instructions change interactively as you assemble.

The SoftICE assembler supports the following instruction sets:

- For Windows 3.1: 386, Floating Point
- For Windows 9x and the Windows NT family: 386, 486, Pentium, Pentium Pro, all corresponding numeric coprocessor instruction sets, and MMX instruction sets

SoftICE also supports the following special syntax:

- Enter USE16 or USE32 on a separate line to assemble subsequent instructions as 16-bit or 32-bit, respectively. If you do not specify

USE16 or USE32, the default is the same as the mode of the current CS register.

- Enter mnemonic commands followed by a list of bytes and/or quoted strings separated by spaces or commas.
- Use the RETF mnemonic to represent a far return.
- Use WORD PTR, BYTE PTR, DWORD PTR, and FWORD PTR to determine data size, if there is no register argument.
- `MOV BYTE PTR ES:[1234.],1`
- Use FAR and NEAR to explicitly assemble far and near jumps and calls. If you do not specify either, the default is NEAR.
- Place operands referring to memory locations in square brackets.
- `MOV AX,[1234]`

For the Windows NT family

Any changes you make to 32-bit code are "sticky." This means they remain in place even if you load or reload the module you change. To remove the changes, do one of the following: restart the Windows NT family, flush the memory image from the cache, or modify the module.

Example

In the following example, you instruct the assembler to assemble the instructions at an offset from the current code segment. The assembler prompts you for assembly instructions after you enter the command. Enter all instructions and press Enter at the address prompt. The assembler assembles the instructions beginning at offset 1234h within the current code segment.

```
A CS:1234
```

ACTION

OS

Windows 3.1

Type

Mode Control

Definition

Set action after breakpoint is reached.

Syntax

ACTION [**nmi**|**int1**|**int3**|**here**|***interrupt-number***|***debugger-name***]

nmi	Generates non-maskable interrupt after breakpoint.
int1	Generates INT1 instruction after breakpoint.
int3	Generates INT3 instruction after breakpoint.
here	Returns control to SoftICE after breakpoint.
interrupt-number	Valid interrupt number between 0 and 5Fh.
debugger-name	Module name of the Windows application debugger which gains control after a SoftICE breakpoint.

Use

The ACTION command determines where to pass control when breakpoint conditions are met. In most cases, you use ACTION to pass control to an application debugger you are using in conjunction with SoftICE. Use the HERE parameter to return to SoftICE when break conditions have been met. Use the NMI, INT1, and INT3 parameters as alternatives for activating DOS debuggers when break conditions are met. Use debugger-name to activate Windows debuggers. To find the module name of the debugger, use the MOD command.

If you specify debugger-name, an INT 0 triggers the Windows debugger. SoftICE ignores breakpoints that the Windows debugger causes if the debugger accesses memory covered by a memory location or range breakpoint. When SoftICE passes control to the Windows debugger with an INT 0, the Windows debugger responds as if a divide overflow occurred and displays a message. Ignore this message because the INT 0 was not caused by an actual divide overflow.

Note: The ACTION command is obsolete under Windows 9x and the Windows NT family.

Example

When using SoftICE with the following products, use the corresponding command.

Product	SoftICE Command
CodeView for DOS	ACTION nmi **Note:** SoftICE generates a non-maskable interrupt when break conditions are met. This gives control to CodeView for DOS.
CodeView for Windows	ACTION cvw
Borland's Turbo Debugger for Windows	ACTION tdw
Multiscope's Debugger for Windows	ACTION rtd

See Also

Refer to setting breakpoints in *Using SoftICE*.

ADDR

OS

Windows 9x

Type

System Information

Definition

Display or switch to address context.

Syntax

ADDR [***context-handle*** | ***process-name***]

context-handle	Address context handle.
process-name	Name of a process.

Use

To be able to view the private address space for an application process, set the current address context within SoftICE to that of the application by providing an address context-handle or the process-name as the first parameter to the ADDR command. To view information on all currently active contexts, use ADDR with no parameters. The first address context listed is the current address context.

Tip: *To use ADDR with the Windows NT family, refer to ADDR on page 11.*

For each address context, SoftICE prints the following information:

- address context handle
- address of the private page table entry array (PGTPTR) of the context
- number of entries that are valid in the PGTPTR array
- starting and ending linear addresses represented by the context
- address of the mutex object used to control access to the context's page tables
- name of the process that owns the context.

When you use the ADDR command with an address context parameter, SoftICE switches address contexts in the same way as Windows.

When switching address contexts, Windows 9x copies all entries in the new context's PGTPTR array to the page directory (pointed to by the CR3 register). A context switch affects the addressing of the lower 2GB of memory from linear address 0 to 7FFFFFFFh. Each entry in a PGTPTR array is a page directory entry which points at a page table that represents 4MB of memory. There can be a maximum of 512 entries in the PGTPTR array to represent the full 2GB. If there are less than 512 entries in the array, the rest of the entries in the page directory are set to invalid values.

When running more than one instance of an application, the same owner name appears in the address context list more than once. If you specify an owner name as a parameter, SoftICE always selects the first address context with a matching name in the list. To switch to the address context of a second or third instance of an application, provide an address context-handle to the ADDR command.

Note: If SoftICE pops up when the System VM (VM 1) is not the current VM, it is possible for context owner information to be paged out and unavailable. In these cases no owner information displays.

Output

For each context or process, the following information displays.

Handle	Address of the context control block. This is the handle that is passed in VxD calls that require a context handle.
Pgtptr	Address of an array of page table addresses. Each entry in the array represents a page table pointer. When address contexts switch, the appropriate location in the page directory receives a copy of this array.
Tables	Number of entries in the PGTPTR array. Not all entries contain valid page directory entries. This is only the number of entries reserved.
MinAddr	Minimum linear address of the address context.
MaxAddr	Maximum address of the address context.
Mutex	Mutex handle used when VMM manipulates the page tables for the context.
Owner	Name of the first process that uses this address context.

Example

The following command displays all currently active address contexts. The context on the top line of the display is the context in which SoftICE popped up. To switch back to this at any time, use the . (DOT) command. When displaying information on all contexts, one line is highlighted, indicating the current context within SoftICE. When displaying data or disassembling code, the highlighted context is the one you see.

```
ADDR

Handle    PGTPTR    Tables Min Addr Max Addr Mutex    Owner
C1068D00  C106CD0C  0200   00400000 7FFFF000 C0FEC770 WINWORD
C104E214  C1068068  0200   00400000 7FFFF000 C1063DBC Rundll32
C105AC9C  C0FE5330  0002   00400000 7FFFF000 C0FE5900 QUICKRES
C1055EF8  C105CE8C  0200   00400000 7FFFF000 C105C5EC Ibserver
C1056D10  C10571D4  0200   00400000 7FFFF000 C1056D44 Mprexe
C10D900C  C10D9024  0002   00400000 7FFFF000 C10D9050
C10493E8  C10555FC  0004   00400000 7FFFF000 C0FE6460 KERNEL32
C1055808  C105650C  0200   00400000 7FFFF000 C105583C MSGSRV32
C10593CC  C1059B78  0200   00400000 7FFFF000 C105908C Explorer
C106AE70  C106DD10  0200   00400000 7FFFF000 C10586F0 Exchng32
C106ABC4  C106ED04  0200   00400000 7FFFF000 C106CA4C Mapisp32
```

Tip: *The current context is highlighted.*

See Also

For the Windows NT family, refer to *ADDR* on page 11.

ADDR

OS

Windows NT family

Type

System Information

Definition

Display or switch to an address context.

Syntax

ADDR [***process-name*** | ***process-id*** | **KPEB**]

process-name	Name of any currently loaded process.
process-id	Process ID. Each process has a unique ID.
KPEB	Linear address of a Kernel Process Environment Block.

Use

Use the ADDR command to both display and change address contexts within SoftICE so that process-specific data and code can be viewed. Using ADDR with no parameters displays a list of all address contexts.

If you specify a parameter, SoftICE switches to the address context belonging to the process with that name, identifier, or process control block address.

Tip: *To use ADDR with Windows 9x, refer to ADDR on page 8.*

If you switch to an address context that contains a Local Descriptor Table (LDT), SoftICE sets up the LDT with the correct base and limit.

All commands that use an LDT only work when the current SoftICE context contains an LDT. LDTs are *never* global under the Windows NT family.

Under low memory conditions, the Windows NT family starts swapping data to disk, including inactive processes, parts of the page directory, and page tables. When this occurs, SoftICE might not be able to obtain the information necessary to switch to contexts that rely on this information. SoftICE indicates this by displaying the message `swapped` in the CR3 field of the process or displaying an error message if an attempt is made to switch to the context of the process.

When displaying information about all contexts, one line is highlighted, indicating the current context within SoftICE. When displaying data or disassembling code, the highlighted context is the one you see.

An * (asterisk) precedes one line of the display, indicating the process that was active when SoftICE popped up. Use the . (DOT) command to switch contexts back to this context at any time.

Output

For each context or process, ADDR shows the following information.

CR3	Physical address of the page directory that is placed into the CR3 register on a process switch to the process.
LDT	If the process has an LDT, this field has the linear base address of the LDT and the limit field for the LDT selector. All of the Windows NT family processes that have an LDT use the same LDT selector. For process switches, the Windows NT family sets the base and limit fields of this selector.
KPEB	Linear address of the Kernel Process Environment Block for the process.
PID	Process ID. Each process has a unique ID.
NAME	Name of the process.

Example

The following example shows the ADDR command being used without parameters to display all the existing contexts.

```
ADDR

CR3       LDT Base:Limit     KPEB     PID        NAME
00030000                     FD8EA920 0002       System
01B69000                     FD8BADE0 001B       winlogon
01CF3000                     FD8B6B40 0027       services
01D37000                     FD8B5760 0029       lsass
00FFA000                     FD8A8AE0 0040       spoolss
009A5000                     FD89F7E0 002B       nddeagnt
00AA5000                     FD89CB40 004A       progman
006D2000  E115F000:FFEF      FD899DE0 0054       ntvdm
```

```
ADDR

CR3        LDT Base:Limit     KPEB     PID         NAME
00837000                      FD896D80 0059        CLOCK
00387000                      FD89E5E0 004E        4NT
*0121C000 E1172000:0187       FD88CCA0 0037        ntvdm
00030000                      8013DD50 0000        Idle
```

See Also

For Windows 9x, refer to *ADDR* on page 8.

PROC

ALTKEY

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Set an alternate key sequence to invoke SoftICE.

Syntax

`ALTKEY [Alt` ***`letter`*** **`|`** **`Ctrl`** ***`letter`*** **`]`**

letter	Any letter (A through Z).

Use

Use the ALTKEY command to change the key sequence (default key Ctrl-D) for popping up SoftICE. Occasionally another program may conflict with the default hot key sequence. You can change the key sequence to either of the following sequences:

`Ctrl + letter`

or

`Alt + letter`

If you do not specify a parameter, the current hot key sequence displays.

To change the hot key sequence every time you run SoftICE, configure SoftICE in the SoftICE Loader to place the ALTKEY command in the SoftICE initialization string.

Example

To specify that the key sequence Alt-Z pops up the SoftICE screen, use the following command.

```
ALTKEY alt z
```

ALTSCR

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Definition

Display SoftICE on an alternate screen.

Syntax

ALTSCR [**mono** | **vga** | **off**]

mono	Redirects SoftICE output to an alternate monochrome monitor using a Hercules-compatible monochrome card. This mode displays 43 lines of text rather than the 25 lines displayed in text mode.
vga	Redirects SoftICE output to an alternate monitor using standard VGA mode.

Use

Use the ALTSCR command to redirect the SoftICE output from the default screen to an alternate monochrome or VGA monitor.

ALTSCR requires the system to have two monitors attached. The alternate monitor should be either a monochrome monitor in a character mode (the default mode), or a VGA card.

The default setting is ALTSCR mode OFF.

Note: To change the SoftICE display screen every time you run SoftICE, place the ALTSCR command in the Initialization string within your SoftICE configuration settings. Refer to Chapter 10, "Customizing SoftICE" in the *Using SoftICE* guide.

In the SoftICE program group, use Display Adapter Setup to select the monochrome monitor. SoftICE automatically starts in monochrome mode making the ALTSCR command unnecessary. Also, use this setting if you are experiencing video problems even when ALTSCR ON is in the initialization string.

Note: ALTSRC VGA Users
If you use an alternate screen in VGA mode, you must disable VGA on the graphics card that will be used to display Windows. You cannot use two cards that are in VGA mode at the same time. Consult the documentation for your graphics card to find the appropriate PCI slot or switches to set.

For Windows 9x

You can also start WINICE with the /M parameter to bypass the initial VGA programming and force SoftICE to an alternate monochrome screen. This is useful if your video board experiences conflicts with the initial programming.

Example

The following command redirects screen output to the alternate monitor in standard VGA mode.

```
ALTSCR vga
```

ANSWER

OS

Windows 9x and the Windows NT family

Type

Customization

Definition

Auto-answer and redirect console to modem.

Syntax

`ANSWER [on [`*`com-port`*`] [`*`baud-rate`*`] [`*`i=init`*`] | off]`

com-port	If no com-port is specified it uses COM1.
baud-rate	Baud-rate to use for modem communications. The default is 38400. The rates include 1200, 2400, 4800, 9600, 19200, 23040, 28800, 38400, 57600, and 115200.
i=init	Optional modem initialization string.

Use

The ANSWER command allows SoftICE to answer an incoming call and redirect all output to a connecting PC running the SERIAL.EXE program in dial mode. After the command is executed, SoftICE listens for incoming calls on the specified com-port while the machine continues normal operation. Incoming calls are generated by the SERIAL.EXE program on a remote machine.

You can place a default ANSWER initialization string in the SoftICE configuration settings. Refer to Chapter 10, “Customizing SoftICE” in the *Using SoftICE* guide.

When SoftICE detects a call being made after the ANSWER command has been entered, it pops up and indicates that it is making a connection with a remote machine, then pops down. The local machine appears to be hung while a remote connection is in effect.

The ANSWER command can be cancelled at any time with ANSWER OFF. This stops SoftICE from listening for incoming calls.

Example

The following is an example of the ANSWER command. SoftICE first initializes the modem on com-port 2 with the string “atx0,” and then returns control to the command prompt. From that point on, it answers calls made on the modem and attempts to connect at a baud rate of 38400 bps.

```
ANSWER on 2 38400 i=atx0
```

The following is an example of a default ANSWER initialization string statement in your SoftICE configuration settings. With this statement in place, SoftICE always initializes the modem specified in ANSWER commands with “atx0,” unless the ANSWER command explicitly specifies an initialization string.

```
ANSWER=atx0
```

See Also

SERIAL

APC

OS

Windows NT family

Type

System Information

Definition

Display Asynchronous Procedure Calls (APC).

Syntax

APC [***address*** | ***TID*** | ***PID***]

address	Location of an asynchronous procedure call.
TID	Thread ID of thread you want to search for asynchronous procedure calls.
PID	Process ID of process you want to search for asynchronous procedure calls.

Use

The APC command displays information about asynchronous procedure calls that are current in the system. If you enter APC with no parameters, SoftICE lists all asynchronous procedure calls queued for delivery in the currently running thread. Or you can instruct SoftICE to walk through a specified thread or process.

Example

The following command displays information about an asynchronous procedure call.

```
APC

APC Object at 806D716C
       PKTHREAD 806E15E0
       APC Queue Flink806E1614 Blink 806E1614
    Routines:
       Kernel 801A3B5Entoskrnl!NtVdmControl+130E
       Rundown 801A44DAntoskrnl!NtVdmControl+1C8A
       Normal  801A3CFAntoskrnl!NtVdmControl+14AA
       Normal Context 00000000
       Argument1 00000000Argument2 00000000
       ApcStateIndex 0
       ApcMode KernelMode
       In APC Queue

User mode APC Queue Empty
```

See Also

DPC

ATTACH

OS

Windows NT family

Type

Customization

Definition

Define a user environment that will be instantiated each time SoftICE pops up.

Syntax

ATTACH [***optional commandmodifiers***][***idxnum***]***addresscontextname*** [***tablename***]

(command only)	Displays a list of defined user environments.
optional commandmodifiers	(See the list of "Optional Command Modifiers" below.)
idxnum	Where *idxnum* is the entry in a list of attach definitions. This makes the attach definition *idxnum* the current active user environment. *Note:* If an index number is specified along with an address context name and/or a tablename, then the previously-defined entry will be overwritten.
Addresscontextname	Specifies the name of an address context to autoswitch to. *Note:* The address context does not exist. It is also possible to enter a name that will never exist. By doing so, you are using only the ATTACH command's *tablename* feature.
tablename	Specifies the name of a table to autoswitch to upon popup. *Note:* The table name does not need to exist. If it cannot be found, SoftICE's normal auto table selection mechanism will be executed.

Optional Command Modifiers

The following optional comand modifiers are used with the ATTACH command:

".detach" – Disassociates a user defined environment and allows auto switching. An alias for the detach command.

".list" – Shows the list of "attach" definitions.

".delete" – Deletes an entry from the list of "attach."

".clear" – Deletes an entry from the list of "attach."

".set idxnum" – Changes the active user environment to that defined by *idxnum*. An alias for the "attach idxnum" command.

".create" – Creates a new entry in the "attach" definition table.

Use

When SoftICE pops up, it automatically locates the active address context and the table that is best suited for this address context. It then automatically changes to that context and table. Under most circumstances, this is the desired behavior. There are instances though when this becomes a hindrance. Namely, when debugging a user mode application or when there are many tables involved and you are only interested in one table. For example, while debugging the gdidemo program, you can debug a problem in a call to ntdll. In this case, you would want to have ntdll symbols loaded. However, by default, SoftICE will automatically switch to the gdidemo table on popup. If you use the "attach SoftICE to a user environment" feature, you can override this behavior.

Notes: At times it is desirable to have the attach functionality only change the address context or the table. This can be accomplished by providing a filler name in the addresscontextname and/or table name parameters.

It is not necessary for a particular address context or table to reside in memory at the point in time the record is created or used. If it is available, a switch will be made to the defined address/table. Otherwise SoftICE will default back to automatic selection.

Example

This first example adds gdidemo with a table of gdidemo. The * indicates that this is the active user environment.

```
:attach gdidemo ntdll
:attach
  Idx     Context Name      Table Name
  *0      gdidemo           gdidemo
```

The next two examples add two more entries. Note that when you create an entry, that entry becomes the active environment.

```
:attach.create csrss ntoskrnl
:attach.list
```

Idx	Context Name	Table Name
0	gdidemo	gdidemo
*1	csrss	ntoskrnl

This example creates an entry with an address context, 'junkname,' that does not exist. The purpose of this entry is to cause SoftICE to always choose the table 'ntdll' on any popup.

```
:attach.create csrss ntoskrnl
:attach.list
```

Idx	Context Name	Table Name
0	gdidemo	gdidemo
1	csrss	ntoskrnl
*2	junkname	ntdll

This example shows how to replace an entry in the table. Specify the index number and then the new address context name/table name.

```
:attach 0 gdidemo user32
:attach
```

Idx	Context Name	Table Name
0	gdidemo	user32
1	csrss	ntoskrnl
*2	junkname	ntdll

BC

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

Clear one or more breakpoints.

Syntax

BC *list* | *

list	Series of breakpoint indexes separated by commas or spaces.
*	Clears all breakpoints.

Example

To clear all breakpoints, use the command:

```
BC *
```

To clear breakpoints 1 and 5, use the following command:

```
BC 1 5
```

If you use the BL command (list breakpoints), the breakpoint list will be empty until you define more breakpoints.

BD

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

Disable one or more breakpoints.

Syntax

BD ***list*** | *****

list	Series of breakpoint indexes separated by commas or spaces.
*	Disables all breakpoints.

Use

Use the BD command to temporarily deactivate breakpoints. Reactivate the breakpoints with the BE command (enable breakpoints).

To tell which of the breakpoints are disabled, list the breakpoints with the BL command. A breakpoint that is disabled has an `*` (asterisk) after the breakpoint index.

Example

To disable breakpoints 1 and 3, use the following command.

```
BD 1 3
```

BE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

Enable one or more breakpoints.

Syntax

BE ***list*** | *****

list	Series of breakpoint indexes separated by commas or spaces.
*	Enables all breakpoints.

Use

Use the BE command to reactivate breakpoints that you deactivated with the BD command (disable breakpoints).

Note: You automatically enable a breakpoint when you first define it or edit it.

Example

To enable breakpoint 3, use the following command.

```
BE 3
```

BH

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

List and select previously set breakpoints from the breakpoint history.

Syntax

BH

Use

Use the BH command to recall breakpoints that you set in both the current and previous SoftICE sessions. All saved breakpoints display in the Command window and can be selected using the following keys:

UpArrow	Positions the cursor one line up. If the cursor is on the top line of the Command window, the list scrolls.
DownArrow	Positions the cursor one line down. If the cursor is on the bottom line of the Command window, the list scrolls.
Insert	Selects the breakpoint at the current cursor line, or deselects it if already selected.
Enter	Sets all selected breakpoints.
Esc	Exits breakpoint history without setting any breakpoints.

SoftICE saves the last 32 breakpoints.

For Windows 3.1 and Windows 9x

Each time Windows exits normally, these breakpoints are written to the WINICE.BRK file in the same directory as WINICE.EXE. Every time SoftICE is loaded, it reads the breakpoint history from the WINICE.BRK file.

For Windows 9x

IF you configure Windows 9x to load SoftICE before WIN.COM by appending \siw95\winice.exe to the end of your AUTOEXEC.BAT, you must also set the BootGUI option in MSDOS.SYS to BootGUI=0. If this option is set to BootGUI=1, Windows 9x does not return control to SoftICE when it shuts down, and SoftICE does not save the break-point history file. Refer to*Using SoftICE* manual for more information about configuring when SoftICE loads.

For the Windows NT family

Breakpoints are written to the WINICE.BRK file in the *SYSTEMROOT*\SYSTEM32\DRIVERS directory.

Example

To select any of the last 32 breakpoints from current and previous SoftICE sessions, use the following command.

```
BH
```

BL

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

List all breakpoints.

Syntax

BL

Use

The BL command displays all breakpoints that are currently set. For each breakpoint, BL lists the breakpoint index, breakpoint type, breakpoint state, and any conditionals or breakpoint actions.

The state of a breakpoint is either enabled or disabled. If you disable the breakpoint, an * (asterisk) appears after its breakpoint index. If SoftICE is activated due to a breakpoint, that breakpoint is highlighted.

The BL command has no parameters.

Example

To display all the breakpoints that have been defined, use the following command.

```
BL
```

- For Windows 3.1

```
0      BPMB #30:123400 W EQ 0010 DR3 C=03
1*     BPR #30:80022800 #30:80022FFF W C=01
2      BPIO 0021 W NE 00FF C=01
3      BPINT 21 AH=3D C=01
```

Note: Breakpoint 1 has an * (asterisk) following it, showing that it was disabled.

◆ For Windows 9x and the Windows NT family

```
00)     BPX #8:80102A4B IF (EAX==1) DO “DD
        ESI”
01) *   BPX _LockWindowInfo
02)     BPMD #013F:0063F8A0 RW DR3
03)     BPINT 2E IF (EAX==0x1E)
```

BMSG

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Breakpoints

Definition

Set a breakpoint on one or more Windows messages.

Syntax

For Windows 3.1

BMSG ***window-handle*** [**L**] [***begin-msg*** [***end-msg***]] [**c=*count***]

For Windows 9x and the Windows NT family

BMSG ***window-handle*** [**L**] [***begin-msg*** [***end-msg***]] [**IF** ***expression***
[**DO "command1;command2;..."**]]

window-handle	HWND value returned from CreateWindow or CreateWindowEX.
L	Logs messages to the SoftICE Command window.
begin-msg	Single Windows message or lower message number in a range of Windows messages. If you do not specify a range with an end-msg, only the begin-msg will cause a break. *Note:* For both begin-msg and end-msg, the message numbers can be specified either in hexadecimal or by using the actual ASCII names of the messages, for example, WM_QUIT.
end-msg	Higher message number in a range of Windows messages.
c=	Breakpoint trigger count.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.
DO command	Breakpoint action: A series of SoftICE commands can execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, "Using Breakpoints," in the *Using SoftICE* manual.

Use

The BMSG command is used to set breakpoints on a window's message handler that will trigger when it receives messages that either match a specified message type, or fall within an indicated range of message types.

- If you do not specify a message range, the breakpoint applies to ALL Windows messages.
- If you specify the L parameter, SoftICE logs the messages into the Command window instead of popping up when the message occurs.

When SoftICE does pop up on a BMSG breakpoint, the instruction pointer (CS:[E]IP) is set to the first instruction of the message handling procedure. Each time SoftICE breaks, the current message displays in the following format:

`hWnd=`*`xxxx`* `wParam=`*`xxxx`* `lParam=`*`xxxxxxxx`* `msg=`*`xxxx message-name`*

Note: These are the parameters that are passed to the message procedure. All numbers are hexadecimal. The message-name is the Windows defined name for the message.

To display valid Windows messages, enter the WMSG command with no parameters. To obtain valid window handles, use the HWND command.

You can set multiple BMSG breakpoints on one window-handle, but the message ranges for the breakpoints may not overlap.

Example

This command sets a breakpoint on the message handler for the Window that has the handle 9BC. The breakpoint triggers and SoftICE pops up when the message handler receives messages with a type within the range WM_MOUSEFIRST to WM_MOUSELAST, inclusive. This range includes all of the Windows mouse messages.

```
BMSG 9BC wm_mousefirst wm_mouselast
```

The next command places a breakpoint on the message handler for the Window with the handle F4C. The L parameter causes SoftICE to log the breakpoint information to the SoftICE Command window when the breakpoint is triggered, instead of popping up. The message range on which the breakpoint triggers includes any message with a type value less than or equal to WM_CREATE. You can view the output from this breakpoint being triggered by popping into SoftICE and scrolling through the command buffer.

```
BMSG f4c L 0 wm_create
```

BPE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

Edit a breakpoint description.

Syntax

BPE *breakpoint-index*

breakpoint-index	Breakpoint index number.

Use

The BPE command allows you to edit or replace an existing breakpoint. Use the editing keys to edit the breakpoint description. Press Enter to save a new breakpoint description. This command offers a quick way to modify the parameters of an existing breakpoint.

Caution: BPE first clears the breakpoint before loading it into the edit line. If you then press the Escape key, the breakpoint is cleared. To retain the original breakpoint and create another one, use the BPT command, which uses the original breakpoint as an editing template without first deleting it.

SoftICE expands any conditional expressions or breakpoint actions that are part of the breakpoint expression.

Example

This command allows the definition for breakpoint 1 to be edited.

```
BPE 1
```

When the command is entered, SoftICE displays the existing breakpoint definition and positions the input cursor just after the breakpoint address.

```
BPE 1

BPX 80104324 if (eax==1) do “dd esi”
```

To re-enter the breakpoint after editing, press the Enter key. To clear the breakpoint, press the Escape key.

BPINT

OS

Windows 3.1

Type

Breakpoints

Definition

Set a breakpoint on an interrupt.

Syntax

BPINT *int-number* [**al**|**ah**|**ax=*value***] [**c=*count***]

int-number	Interrupt number from 0 to 5Fh.
value	Byte or word value.
c=	Breakpoint trigger count.

Use

Use the BPINT command to pop up SoftICE whenever a specified processor exception, hardware interrupt, or software interrupt occurs. The AX register qualifying value
(AL=, AH=, or AX=) can be used to set breakpoints that trigger only when the AX register matches the specified value at the time that the interrupt or exception occurs. This capability is often used to selectively set breakpoints for DOS and BIOS calls. If an AX register value is not entered, the breakpoint occurs anytime the interrupt or exception occurs.

Tip: *For Windows 9x and the Windows NT family, refer to* *BPINT on page 38.*

For breakpoints that trigger because of hardware interrupts or processor exceptions, the instruction pointer (CS:EIP) at the time SoftICE pops up points to the first instruction of the interrupt or exception handler routine pointed to by the interrupt descriptor table (IDT.) If a software interrupt triggers the breakpoint, the instruction pointer (CS:EIP) points at the INT instruction that caused the breakpoint.

BPINT only works for interrupts that are handled through the IDT.

In addition, Windows maps hardware interrupts, which by default map to vectors 8-Fh and 70h-77h, to higher numbers to prevent conflicts with software interrupts. The primary interrupt controller is mapped from vector 50h-57h. The secondary interrupt controller is mapped from vector 58h-5Fh.

Example: `IRQ0 is INT50h and IRQ8 is INT58h.`

If a BPINT triggers because of a software interrupt instruction in a DOS VM, control will be transferred to the Windows protected mode interrupt handler for protection faults. This handler eventually calls down to the appropriate DOS VM's interrupt handler which is pointed to by the DOS VM's Interrupt Vector Table. To go directly to the DOS VM's interrupt handler after the BPINT has occurred on a software interrupt instruction, use the following command:

`G @$0:`*`int-number`*`*4`

Example

The following command defines a breakpoint for interrupt 21h. The breakpoint occurs when DOS function call 4Ch (terminate program) is called. At the time SoftICE pops up, the instruction pointer points to the INT instruction in the DOS VM.

```
BPINT 21 ah=4c
```

The next command sets a breakpoint that triggers on each and every tick of the hardware clock. In general, this command is not recommended because it triggers so often. At the time SoftICE pops up, the instruction pointer will be at the first instruction of the Windows interrupt handler for interrupt 50h.

```
BPIO
```

See Also

For Windows 9x and the Windows NT family, refer to *BPINT* on page 38.

BPINT

OS

Windows 9x and the Windows NT family

Type

Breakpoints

Definition

Set a breakpoint on an interrupt.

Syntax

BPINT ***int-number*** [**IF** ***expression***] [**DO "command1;command2;..."**]

int-number	Interrupt number from 0 to FFh.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger
DO command	Breakpoint action: A series of SoftICE commands that execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, “Using Breakpoints,” in the Using SoftICE manual.

Use

Use the BPINT command to pop up SoftICE whenever a specified processor exception, hardware interrupt, or software interrupt occurs. You can use the IF option to specify a conditional expression that limits the interrupts that trigger the breakpoint. You can use the DO option to specify SoftICE commands that execute any time the interrupt breakpoint triggers.

For breakpoints that trigger for hardware interrupts or processor exceptions, the instruction pointer (CS:EIP) at the time SoftICE pops up points to the first instruction of the interrupt or exception handler routine pointed to by the interrupt descriptor table (IDT.) If a software interrupt triggers the breakpoint, the instruction pointer (CS:EIP) points to the INT instruction that caused the breakpoint.

Tip: *For Windows 3.1, refer to BPINT on page 36.*

BPINT only works for interrupts that are handled through the IDT.

If a software interrupt occurs in a DOS VM, control is transferred to a Windows protected mode interrupt handler. This handler eventually calls down to the DOS VM's interrupt handler which is pointed to by the DOS VM's Interrupt Vector Table). To go directly to the DOS VM's interrupt handler after the BPINT has occurred on a software interrupt instruction, use the following command:

`G @ &0:(`*`int-number`*`*4)`

For Windows 9x

Windows maps hardware interrupts, which by default map to vectors 8-Fh and 70h-77h, to higher numbers to prevent conflicts with software interrupts. The primary interrupt controller is mapped from vector 50h-57h. The secondary interrupt controller is mapped from vector 58h-5Fh.

Example: IRQ0 `is INT50h and IRQ8 is INT58h.`

For the Windows NT family

The Windows NT family maps hardware interrupts, which by default map to vectors 8-Fh and 70h-77h, to higher numbers to prevent conflicts with software interrupts. The primary interrupt controller is mapped from vector 30h-37h. The secondary interrupt controller is mapped from vector 38h-3Fh.

Example: `IRQ0 is INT30h and IRQ8 is INT38h`

Example

The following example results in Windows NT family system call breakpoints (software interrupt 2Eh) only being triggered if the thread making the system call has a thread ID (TID) equal to the current thread at the time the command is entered (_TID). Each time the breakpoint hits, the contents of the address 82345829h are dumped as a result of the DO option.

```
BPINT 2e if tid==_tid do "dd 82345829"
```

See Also

For Windows 3.1, refer to *BPINT* on page 36.

BPIO

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Breakpoints

Definition

Set a breakpoint on an I/O port access.

Syntax

For Windows 3.1

BPIO *port* [***verb***] [***qualifier value***] [**c=*count***]

For Windows 9x

BPIO [-h] *port* [***verb***] [**IF *expression***] [**DO "command1;command2;..."**]

For the Windows NT family

BPIO *port* [***verb***] [**IF *expression***] [**DO "command1;command2;..."**]

port Byte or word value.

verb

Value	Description
R	Read (IN)
W	Write (OUT)
RW	Reads and Writes

qualifier

Qualifier Value	Description
EQ	Equal

Tip: *Qualifier, value, and C= are not valid for Windows 9x and Windows NT*

Qualifier Value	Description
NE	Not Equal
GT	Greater Than
LT	Less Than
M	Mask. A bit mask is represented as a combination of 1's, 0's and X's. X's are don't-care bits.

value	Byte, word, or dword value.
c=	Breakpoint trigger count.
-h	Use hardware debug registers to set a breakpoint in a virtual device (VxD.) Available for Pentium-class processors on Windows 9x only.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.
DO command	Breakpoint action: A series of SoftICE commands can execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, "Using Breakpoints," in the *Using SoftICE* manual.

Use

Use the BPIO instruction to have SoftICE pop up whenever a specified I/O port is accessed in the indicated manner. When a BPIO breakpoint triggers, the instruction pointer (CS:EIP) points to the instruction following the IN or OUT instruction that caused the breakpoint.

If you do not specify a verb, RW is the default.

For Windows 3.1

If you specify verb and value parameters, SoftICE compares the value you specify with the actual data value read or written by the IN or OUT instruction that caused the breakpoint. The value may be a byte, a word, or a dword. You can use the verb parameter to specify a comparison of equality, inequality, greater-than-or-equal, less-than-or-equal, or logical AND.

For Windows 3.1 and Windows 9x

Due to the behavior of the x86 architecture, BPIO breakpoints are only active while the processor is executing in the RING 3 privilege level. This means that I/O activity performed by RING 0 code, such as VxDs and the Windows virtual machine manager (VMM), is not trapped by BPIO breakpoints. For Windows 9x only, you can use the -H switch to force SoftICE to use the hardware debug registers. This lets you trap I/O performed at Ring 0 in VxDs.

Windows virtualizes many of the system I/O ports, meaning that VxDs have registered handlers that are called when RING 3 accesses are made to the ports. To get a list of virtualized ports, use the TSS command. This command shows each hooked I/O port, the address of its associated handler, and the name of the VxD that owns it. To see how a particular port is virtualized, set a BPX command on the address of the I/O handler.

For the Windows NT family

The BPIO command uses the debug register support provided on the Pentium, therefore, I/O breakpoints are only available on Pentium-class machines.

When using debug registers for I/O breakpoints, all physical I/O instructions (non-emulated) are trapped no matter what privilege level they are executed from. This is different from using the I/O bit map to trap I/O, as is done for SoftICE running under Windows 3.1 and Windows 9x (without the -H switch). The I/O bit map method can only trap I/O done from user-level code, whereas a drawback of the debug register method for trapping port I/O is that it does not trap emulated I/O such as I/O performed from a DOS box.

Due to limitations in the number of debug registers available on x86 processors, a maximum of four BPIOs can be set at any given time.

Example

The following commands define conditional breakpoints for accesses to port 21h (interrupt control 1’s mask register). The breakpoints only trigger if the access is a write access, and the value being written is not FFh.

For Windows 3.1, use the following command.

```
BPIO 21 w ne ff
```

For Windows 9x and the Windows NT family, use the following command.

```
BPIO 21 w if (al!=0xFF)
```

Note: In the Windows NT/2000/XP example, you should be careful about intrinsic assumptions being made about the size of the I/O operations being trapped. The port I/O to be trapped is OUTB. An OUTW with AL==FFh also triggers the breakpoint, even though in that case the value in AL ends up being written to port 22h.

The following example defines a conditional byte breakpoint on reads of port 3FEh. The breakpoint occurs the first time that I/O port 3FEh is read with a value that has the two high-order bits set to 1. The other bits can be of any value.

For Windows 3.1, use the following command.

```
BPIO 3fe r eq m 11xx xxxx
```

For Windows 9x and the Windows NT family, use the following command.

```
BPIO 3fe r if ((al & 0xC0)==0xC0)
```

BPM

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Breakpoints

Definition

Set a breakpoint on memory access or execution.

Syntax

For Windows 3.1

BPM[***size***] ***address*** [***verb***] [***qualifier value***] [***debug-reg***] [**c=*count***]

For Windows 9x

BPM[***size***] [***.t***|***.p***|***.a***|***.v***] ***address*** [***verb***] [***debug-reg***] [**IF *expression***] [**DO "command1;command2;..."**]

For the Windows NT family

BPM[***size***] [***.t***|***.p***] ***address*** [***verb***] [***debug-reg***] [**IF *expression***] [**DO "command1;command2;..."**]

size — Size specifies the range covered by this breakpoint . For example, if you use double word, and the third byte of the dword is modified, a breakpoint occurs. The size is also important if you specify the optional qualifier (i.e., **BPMB**, **BPMW**, or **BPMD**).

Value	Description
B	Byte
W	Word
D	Double Word

command modifier — SoftICE can accept the command modifiers (.t, .p, .a, and .v) to limit the scope of a breakpoint for all breakpoint commands. The modifiers available depend on the OS being used, as shown in the following table.

Value	Description	Operating System
.t	Conditionally set the breakpoint to trigger in the active thread.	Win9x, Win NT/2K/XP
.p	Conditionally set the breakpoint to trigger in the active Process ID.	Win9x, Win NT/2K/XP
.a	Conditionally set the breakpoint to trigger in the active address context.	Win9x
.v	Conditionally set the breakpoint to trigger in the active VMM ID.	Win9x

verb

Value	Description
R	Read
W	Write
RW	Reads and Writes
X	Execute

qualifier

These qualifiers are only applicable to read and write breakpoints; not execution breakpoints.

Tip: *Qualifier, value, and C= are not valid for Windows 9x and Windows NT*

Qualifier Value	Description
EQ	Equal
NE	Not Equal
GT	Greater Than
LT	Less Than
M	Mask. A bit mask is represented as a combination of 1's, 0's and X's. The X's are "don't-care" bits.

value

Byte, word, or double word value, depending on the *size* you specify.

debug-reg	Value
	DR0
	DR1
	DR2
	DR3

c=	Breakpoint trigger count.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.
DO command	Breakpoint action: A series of SoftICE commands that execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, “Using Breakpoints,” in the *Using SoftICE* manual.

Use

Use BPM breakpoints to have SoftICE pop up whenever certain types of accesses are made to memory locations. You can use the size and verb parameters to filter the accesses according to their type, and you can use the DO parameter, only on Windows NT family platforms, to specify arbitrary SoftICE commands that execute each time the breakpoint is hit.

If you do not specify a debug register, SoftICE uses the first available debug register starting from DR3 and working backwards. You should not include a debug register unless you are debugging an application that uses debug registers itself, such as another debugging tool.

If you do not specify a verb, RW is the default.

If you do not specify a size, B is the default.

For all the verb types *except* X, SoftICE pops up after the instruction that causes the breakpoint to trigger has executed, and the CS:EIP points to the instruction in the code stream following the trapped instruction. For the X verb, SoftICE pops up before the instruction causing the breakpoint to trigger has executed, and the CS:EIP points to the instruction where the breakpoint was set.

If you specify the R verb, breakpoints occur on read accesses and on write operations that do not change the value of the memory location.

If you specify a verb of R, W or RW, *executing* an instruction at the specified address does not cause the breakpoint to occur.

If you specify a size of W (BPMW), it is a word-sized memory breakpoint, and you must specify an address that starts on a word boundary. If you specify a size of D (BPMD), the memory breakpoint is dword sized, and you must specify an address that starts on a double-word boundary.

For Windows 3.1

On Windows 3.1, you can use the count parameter to trigger a breakpoint only after it has been hit a specified number of times. The default count value is 1, meaning that the breakpoint triggers the first time the breakpoint condition is satisfied. The count is reset each time the breakpoint triggers.

For Windows 9x

BPM breakpoints set in the range 400000 - 7FFFFFFF (WIN32 applications) are address-context sensitive. That is, the breakpoints are triggered only when the address context in which the breakpoint was set is active. If a BPM is set in a DLL that exists in multiple contexts, the breakpoint is armed in all the contexts in which it exists. For example, if you set a BPM X breakpoint in KERNEL32 it could break in any context that contains KERNEL32.DLL.

For the Windows NT family

Any breakpoint set on an address below 80000000h (2 GB) is address-context sensitive. That is, the breakpoint is triggered only when the address context in which the breakpoint was set is active. This includes WIN32 and DOS V86 applications. Take care to ensure you are in the correct context before setting a breakpoint.

Example

The following example defines a breakpoint on memory byte access to the address pointed at by ES:DI+1Fh. The first time that 10h is written to that location, the breakpoint triggers.

For Windows 3.1, use the following command.

```
BPM es:di+1f w eq 10
```

For Windows 9x and the Windows NT family, use the following command.

```
BPM es:di+1f w if (*(es:di+1f)==0x10)
```

The next example defines an execution breakpoint on the instruction at address CS:80204D20h. The first time that the instruction at the address is executed, the breakpoint occurs.

For Windows 3.1, Window 9x, and the Windows NT family, use the following command.

```
BPM CS:80204D20 x
```

The following example defines a word breakpoint on a memory write. The breakpoint occurs the first time that location `Foo` has a value written to it that sets the high order bit to 0 and the low order bit to 1. The other bits can be any value.

For Windows 3.1, use the following command.

```
BPMW foo e eq m 0xxx xxxx xxxx xxx1
```

This example sets a byte breakpoint on a memory write. The breakpoint triggers the first time that the byte at location DS:80150000h has a value written to it that is greater than 5.

For Windows 3.1, use the following command.

```
BPM ds:80150000 w gt 5
```

For Windows 9x and the Windows NT family, use the following command.

```
BPM ds:80150000 if (byte(*ds:80150000)>5)
```

BPR

OS

Windows 3.1 and Windows 9x

Type

Breakpoints

Definition

Set a breakpoint on a memory range.

Syntax

For Windows 3.1

BPR *start-address end-address* [***verb***] [**c=*count***]

For Windows 9x

BPR *start-address end-address* [***verb***] [**IF *expression***]
[**DO "command1;command2;..."**]

start-address	Beginning of memory range.
end-address	Ending of memory range.
verb	

Value	Description
R	Read
W	Write
RW	Reads and Writes
T	Back Trace on Execution
TW	Back Trace on Memory Writes

c=	Breakpoint trigger count.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.
DO command	Breakpoint action: A series of SoftICE commands that can execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, "Using Breakpoints," in the *Using SoftICE* manual.

Use

Use the BPR command to set breakpoints that trigger whenever certain types of accesses are made to an entire address range.

There is no explicit range breakpoint for execution access. However, you can use the R verb to set execution breakpoints on a range. An instruction fetch is considered a read for range breakpoints.

If you do not specify a verb, W is the default.

The range breakpoint degrades system performance in certain circumstances. Any read or write within the 4KB page that contains a breakpoint range is analyzed by SoftICE to determine if it satisfies the breakpoint condition. This performance degradation is usually not noticeable, however, degradation could be extreme in cases where there are frequent accesses to the range.

The T and TW verbs enable back trace ranges on the specified range. They do not cause breakpoints, but instead write information about all instructions that would have caused the breakpoint to trigger to a log that can be displayed with the SHOW or TRACE commands.

When a range breakpoint is triggered and SoftICE pops up, the current CS:EIP points to the instruction that caused the breakpoint.

Range breakpoints are always set in the page tables that are active when you enter the BPR command. Therefore, if range addresses are below 4MB, the range breakpoint will be tied to the virtual machine that is current when BPR is entered. Because of this fact, there are some areas in memory where range breakpoints are not supported. These include the page tables, global descriptor table (GDT), interrupt descriptor tables (IDT), local descriptor table (LDT), and SoftICE itself. If you try to set a range breakpoint or back trace range over one of these areas, SoftICE returns an error.

There are two other data areas in which you should not place a range breakpoint, but, if you do, SoftICE will not return an error. These are Windows level 0 stacks and critical areas in the VMM. Windows level 0 stacks are usually in separately allocated data segments. If you set a range over a level 0 stack or a critical area in VMM, you could hang the system.

If the memory that covers the range breakpoint is swapped or moved, the range breakpoint follows it.

For Windows 3.1

The count parameter can be used to trigger a breakpoint only after it has been hit a specified number of times. The default count value is 1, meaning that the breakpoint will trigger the first time the breakpoint condition is satisfied. The count is reset each time the breakpoint triggers.

For Windows 9x

Due to a change in system architecture, BPRs are no longer supported in level 0 code. Thus, you cannot use BPRs to trap VxD code.

Example

The following example defines a breakpoint on a memory range. The breakpoint occurs if there are any writes to the memory between addresses ES:0 and ES:1FFF:

```
BPR es:0 es:1fff w
```

BPRW

OS

Windows 3.1 and Windows 9x

Type

Breakpoints

Definition

Set range breakpoints on Windows program or code segment.

Syntax

For Windows 3.1

BPRW ***module-name*** | ***selector*** [***verb***]

For Windows 9x

BPRW ***module-name*** | ***selector*** [***verb***] [**IF** ***expression***]
[**DO "command1;command2;..."**]

module-name Any valid Windows Module name that contains executable code segments.

selector Valid 16-bit selector in a Windows program.

verb

Value	Description
R	Read
W	Write
RW	Reads and Writes
T	Back Trace on Execution
TW	Back Trace on Memory Writes

IF expression Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.

DO command Breakpoint action: A series of SoftICE commands can execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, “Using Breakpoints,” in the *Using SoftICE* manual.

Use

The BPRW command is a short-hand way of setting range breakpoints on either all of the code segments, or on a single segment of a Windows program.

The BPRW command actually sets the same type of breakpoint as the BPR command. Thus, if you enter the BL command after entering a BPRW command, you can see where separate range breakpoints were set to cover the segments specified in the BPRW command.

Valid selectors for a 16-bit Windows program can be obtained with the HEAP instruction.

Clearing the breakpoints created by BPRW commands requires that each of these range breakpoints be separately cleared with the BC command.

Note: The BPRW command can become very slow when using the T verb to back trace or when using the command in conjunction with a CSIP qualifying range.

For Windows 9x

Due to a change in system architecture, BPRs are no longer supported in level 0 code. For example, you cannot use BPRs to trap VxD code.

When a BPRW is set on a 32-bit application or DLL, a single range breakpoint is set starting at the executable image base and ending at the image base plus image size.

Common Uses

The BPRW command is commonly used in the following ways.

- To set a back trace history range over an entire Windows application or DLL, specify the module-name and the T verb.
- To set a breakpoint that triggers whenever a program executes, use the R verb. The R verb breaks on execution as well as reads because an instruction fetch is considered a read for range breakpoints.
- To use BPRW as a convenient form of BPR. Instead of requiring you to look up a segment’s base and limit through the LDT or GDT commands, you only need to know the segment selector.

Example

The following example sets up a back trace range on all of the code segments in the Program Manager. All instructions that the Program Manager executes are logged to the back trace history buffer and can later be viewed with the TRACE and SHOW commands.

```
BPRW progman t
```

BPT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Manipulating Breakpoints

Definition

Use a breakpoint description as a template.

Syntax

BPT [***.t*** | ***.p***] ***breakpoint number***

Command Modifier	The command modifier (***.t*** or ***.p***) limits the scope of a breakpoint.
breakpoint number	Breakpoint index number.

Use

The BPT command uses an existing breakpoint description as a template for defining a new breakpoint. The BPT command loads a template of the breakpoint description into the edit line for modification. Use the editing keys to edit the breakpoint description and type Enter to add the new breakpoint description. The original breakpoint referenced by *breakpoint-index* is not altered. This command offers a quick way to modify the parameters of an existing breakpoint.

When SoftICE displays a breakpoint description, it expands any conditional expressions or breakpoint actions.

Example

The following example moves a template of breakpoint 3 into the edit line, without removing breakpoint 3. An example of the edit line output by the command follows.

```
BPT 3
:BPX 1b:401200 if (eax==1) do "dd esi"
```

Press **Enter** to add the new breakpoint.

BPX

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Breakpoints

Key

F9

Definition

Set or clear a breakpoint on execution.

Syntax

For Windows 3.1

BPX [***address***] [**c=*count***]

For Windows 9x and the Windows NT family

BPX[***.t***|***.p***][***address***] [**IF *expression***] [**DO "command1;command2;..."**]

Command Modifier	The command modifier (***.t*** or ***.p***) limits the scope of a breakpoint.
address	Linear address to set execution breakpoint.
c=	Breakpoint trigger count.
IF expression	Conditional expression: the expression must evaluate to TRUE (non-zero) for the breakpoint to trigger.
DO command	Breakpoint action: A series of SoftICE commands that execute when the breakpoint triggers.

Note: You can combine breakpoint count functions (BPCOUNT, BPMISS, BPTOTAL, BPLOG, and BPINDEX) with conditional expressions to monitor and control breakpoints based on the number of times a particular breakpoint has or has not triggered. See Chapter 6, “Using Breakpoints,” in the *Using SoftICE* manual.

Use

Use the BPX command to define breakpoints that trigger whenever the instruction at the specified address is executed.

The command modifier (*.t* or *.p*) limits the scope of a breakpoint. The *.t* modifier conditionally sets the breakpoint to trigger in the active thread, while the *.p* modifier conditionally sets the breakpoint to trigger in the active Process ID.

You must set the *address* parameter to point to the first byte of the instruction opcode of the instruction on which you want to set the breakpoint. If no address is specified and the cursor is in the Code window when you begin to type the command, a “point-and-shoot” breakpoint is set at the address of the instruction at the cursor location in the Code window. If you define a point-and-shoot breakpoint at an address where a breakpoint already exists, the existing breakpoint is cleared.

Note: Use the EC command (default key F6) to move the cursor into the Code window.

If the cursor is not in the Code window when you enter the BPX command, you must specify an address. If you specify only an offset, the current CS register value is used as the segment.

The BPX command normally places an INT 3 instruction at the breakpoint address. This breakpoint method is used instead of assigning a debug register to make more execution breakpoints available. If you need to use a breakpoint register, for example, to set a breakpoint on code not yet loaded in a DOS VM, set an execution breakpoint with the BPM command and specify X as the verb.

If you try to set a BPX at an address that is in ROM, a breakpoint register is automatically used for the breakpoint instead of the normal placement of an INT 3 at the target address. This method must be used because ROM cannot be modified.

The BPX command accepts 16-bit Windows module names as an address parameter. When you enter a 16-bit module name, SoftICE sets a BPX-style breakpoint on every exported entry point in the module.

BPX KERNEL sets a breakpoint on every function in the 16-bit Windows module KRNL386.EXE. This can be very useful when you need to set a break the next time any function in a DLL is called.

SoftICE supports a maximum of 256 breakpoints when you use this command.

For Windows 3.1 and Windows 9x

BPX breakpoints in DOS VMs are tied to the VM in which they were set. This is normally what you would like when debugging a DOS program in a DOS VM. However, there are situations when you may want the breakpoint to trigger at a certain address no matter what VM is currently mapped in. This is usually true when debugging in DOS code or in a TSR that was run before Windows was started. In these cases, use a BPM breakpoint with the X verb instead of BPX.

For Windows 9x

BPX breakpoints set in the range 400000 - 7FFFFFFF (WIN32 applications) are address-context sensitive. That is, they are only triggered when the context in which they were set is active. If a breakpoint is set in a DLL that exists in multiple contexts, however, the breakpoint will exist in all contexts.

For the Windows NT family

Any breakpoint set on an address below 80000000h (2 GB) is address-context sensitive. That is, they are only triggered when the context in which they were set is active. This includes WIN32, WIN16, and DOS V86 applications. Take care to ensure you are in the correct context before setting a breakpoint.

Example

This example sets an execution breakpoint at the instruction 10h bytes past the current instruction pointer (CS:EIP).

```
BPX eip+10
```

This example sets an execution breakpoint at source line 1234 in the current source file (refer to *FILE* on page 120).

```
BPX .1234
```

For Windows 9x and the Windows NT family

The following is an example of the use of a conditional expression to qualify a breakpoint. In this case, the breakpoint triggers if the EAX register is within the specified range.

```
BPX eip if eax > 1ff && eax <= 300
```

In this example, a breakpoint action is used to have SoftICE automatically dump a parameter for a call. Every time the breakpoint is hit, the contents of the string pointed to by the current DS:DX displays in the Data window.

```
BPX 80023455 do “db ds:dx”
```

See Also

FILE

BSTAT

OS

Windows 9x and the Windows NT family

Type

Breakpoints

Definition

Display statistics for one or more breakpoints.

Syntax

```
BSTAT [breakpoint #]
```

breakpoint #	Breakpoint index number.

Use

Use BSTAT to display statistics on breakpoint hits, misses, and whether breakpoints popped up SoftICE or were logged. A breakpoint will be logged to the history buffer instead of popping up SoftICE if it has a conditional expression that uses the BPLOG expression macro.

Since conditional expressions are evaluated when the breakpoint is triggered, it is possible to have evaluation run-time errors. For example, a virtual symbol may be referenced when that symbol has not been loaded, or a reference to a symbol may not be resolved because the memory is not present. In such cases, an error will be generated and noted in the Status and Scode fields under the Misc. column in the BSTAT output.

Output

For each breakpoint, SoftICE displays the following information.

BP #	Breakpoint index, and if disabled, an * (asterisk).

Totals Category:

Hits	Total number of times SoftICE has evaluated the breakpoint.
Breaks	Total number of times the breakpoint has evaluated TRUE, and SoftICE has either popped up or logged the breakpoint.
Popups	Total number of times the breakpoint caused SoftICE to pop

up.

Logged	Total number of times the breakpoint has been logged.
Misses	Total number of times the breakpoint evaluated to FALSE, and no breakpoint action was taken.
Errors	Total number of times that the evaluation of a breakpoint resulted in an error.

Current Category:

Hits	Current number of times the breakpoint has evaluated TRUE, but did not pop up because the count had not expired. (Refer to expression macro BPCOUNT.)
Misses	Current number of times the breakpoint has evaluated FALSE or the breakpoint count has not expired.

Miscellaneous Category:

Status	SoftICE internal status code for the last time the breakpoint was evaluated, or zero if no error occurred.
Scode	Last non-zero SoftICE internal status code, or zero if no error has occurred.
Cond.	“Yes” if the breakpoint has a conditional expression, otherwise “No”.
Action	“Yes” if the breakpoint has a defined breakpoint action, otherwise “No”.

Example

The following is an example using the BSTAT command for breakpoint #0:

```
BSTAT 0

Breakpoint Statistics for #00
   BP #      *00

Totals
   Hits      2
   Breaks    2
   Popups    2
   Logged    0
   Misses    0
   Errors    0

Current
   Hits      0
   Misses    0

Misc
   Status    0
   SCode     0
   Cond.     No
   Action    Yes
```

See Also

For more information on breakpoint evaluation, refer to *Using SoftICE*.

C

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Compare two data blocks.

Syntax

C *start-address* L *length* *start-address-2*

start-address	Start of first memory range.
L *length*	Length in bytes.
start-address-2	Start of second memory range.

Use

The memory block specified by start-address and length is compared to the memory block specified by the second start address.

When a byte from the first data block does not match a byte from the second data block, SoftICE displays both bytes and their addresses.

Example

The following example compares 10h bytes starting at memory location DS:805FF000h to the 10h bytes starting at memory location DS:806FF000h.

```
C ds:805ff000 L 10 ds:806ff000
```

CLASS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display information on Windows classes.

Syntax

For Windows 3.1

CLASS [***module-name***]

For Windows 9x

CLASS [**-x**] [***task-name***]

For the Windows NT family

CLASS [**-x**] [***process-type*** | ***thread-type*** | ***module-type*** | ***class-name***]

module-name	Any currently loaded Windows module. Not all Windows modules have classes registered.
-x	Display complete Windows 9x or the Windows NT family internal CLASS data structure, expanding appropriate fields into more meaningful forms.
task-name	Any currently executing 16- or 32-bit task.
process-type	Process name, process ID, or process handle.
thread-type	Thread ID or thread address (KTEB).
module-type	Module name or module handle.
class-name	Name of a registered class window.

For Windows 9x

The operating system maintains the standard window classes in the 16-bit user module (per Windows 3.1). The operating system maintains all other window classes in separate lists on behalf of each process. Each time a process or one of its DLLs registers a new window class, registration places that class on one of two lists:

- The application global list contains classes registered with the CS_GLOBAL attribute. They are accessible to the process or any of its DLLs.
- The application private list contains non-global classes. Only the registering module can access them.

Finally, any process or DLL that attempts to superclass one of the standard window controls, for example, LISTBOX, receives a copy of that class. The copy resides in a process-specific system-superclass list. By making a copy of the standard class, a process or DLL can superclass any standard windows control without affecting other processes in the system.

The process-specific class lists display in the following order:

- application private
- application global
- system superclassed

In the output, dashed lines separate each list.

For the Windows NT family

The architecture of class information under the Windows NT family is similar to that of Windows 9x in that class information is process specific and the operating system creates different lists for global and private classes. Beyond this, the two operating systems have significant differences in how super-classing a registered window class is implemented.

Under the Windows NT family, registered window classes are considered *templates* that describe the base characteristics and functionality of a window (similar to the C++ notion of an abstract class). When a window of any class is created, the class template is *instanced* by making a physical copy of the class structure. This instanced class is stored with the windows instance data. Any changes to the instanced class data does not affect the original class template. This concept is further extended when various members of the windows instanced class structure are modified. When this occurs, the instanced class is instanced again, and the new instance points to the original instance. Registered classes act as templates from which instances of a particular class can be created; in effect this is object inheritance. This inheritance continues as changes are made to the base functionality of the class.

If you do not specify the type parameter, the current context is assumed, because the class information is process specific. A process-name always overrides a module of the same name. To search by module when there is a name conflict, use the module handle (base address or module database selector). Also, module names are *always* context sensitive. If the module is not loaded in the current context (or the CSRSS context), the CLASS command interprets the module name as a class name instead.

Output

For each class, the following information is shown:

Class Handle	Offset of a data structure within USER. Refers to windows of this class.
Class Name	Name that was passed when the class was registered. If no name was passed, the atom displays.
Owner	Module that has registered this window class.
Window Procedure	Address of the window procedure for this window class.
Styles	Bitmask of flags specified when the class was registered.

Example

For Windows 3.1

The following example uses the CLASS command to display all the classes registered by the MSWORD module.

```
CLASS msword

Handle      Name        Owner       Window Procedure
0F24        #32772      USER        TITLEWNDPROC
0EFC        #32771      USER        SWITCHWNDPROC
0ED4        #32769      USER        DESKTOPWNDPROC
0E18        MDIClient   USER        MDICLNTWNDPROC
0DDC        ComboBox    USER        COMBOBXWNDPROC
```

```
CLASS msword

Handle        Name          Owner         Window Procedure
0DA0          ComboLBox     USER          LBBOXTLWNDPROC
0D64          ScrollBar     USER          SBWNDPROC
0D28          ListBox       USER          LBOXCTLWNDPROC
0CF0          Edit          USER          EDITWNDPROC
```

Note: There are symbols for all of the window procedures, because SoftICE includes all of the exported symbols from USER.EXE. If a symbol is not available for the window procedure, a hexadecimal address displays.

CLS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Alt-F5

Definition

Clear the Command window.

Syntax

CLS

Use

The CLS command clears the SoftICE Command window and all display history, and moves the prompt and the cursor to the upper lefthand corner of the Command window.

CODE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Display instruction bytes.

Syntax

CODE [**on** | **off**]

Use

The CODE command controls whether or not the actual hexadecimal bytes of an instruction display when the instruction is unassembled.

- If CODE is ON, the instruction bytes display.
- If CODE is OFF, the instruction bytes do not display.
- Use CODE with no parameters to display the current state of CODE.

The default is CODE mode OFF.

Example

The following command causes the actual hexadecimal bytes of an instruction to display when the instruction is unassembled.

```
CODE on
```

See Also

SET

COLOR

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Display or set the screen colors.

Syntax

COLOR [**normal bold reverse help line**] | [**RESET**]

normal	Foreground/background attribute that displays normal text. Default = 07h grey on black.
bold	Foreground/background attribute that displays bold text. Default = 0Fh white on black.
reverse	Foreground/background attribute that displays reverse video text. Default = 71h blue on grey.
help	Foreground/background attribute that displays the help line underneath the Command window. Default = 30h black on cyan.
line	Foreground/background attribute that displays the horizontal lines between the SoftICE windows. Default = 02h green on black.
RESET	Reset all colors to their default values.

Use

Use the COLOR command to customize the SoftICE screen colors on a color monitor. Each of the five specified colors is a hexadecimal byte where the foreground color is in bits 0-3 and the background color is in bits 4-6. This is identical to the standard CGA attribute format in which there are 16 foreground colors and 8 background colors.

The actual colors represented by the 16 possible codes are listed in the following table.

Code	Color	Code	Color
0	black	A	light green
1	blue	B	light cyan
2	green	C	light red
3	cyan	D	light magenta
4	red	E	yellow
5	magenta	F	white
6	brown		
7	grey		
8	dark grey		
9	light blue		

Example

The command below makes the following color assignments.

normal text	grey on black
bold text	white on black
reverse video text	blue on grey
help line	black on cyan
horizontal line	green on black

```
COLOR 7 f 71 30 2
```

CPU

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the registers.

Syntax

```
CPU [-i]
```

-i	Displays the I/O APIC.

Use

The CPU command shows all the CPU registers (general, control, debug, and segment).

For the Windows NT family

If your PC contains a multi-processor motherboard that uses an I/O Advanced Program Interrupt Controller (APIC) as an interrupt controller, the CPU command displays the CPU local registers and the I/O APIC information.

Example

The following example lists the sample output from the CPU command under Windows 9x or the Windows NT family on systems that do not use an I/O APIC:

```
Processor 00 Registers
----------------------
CS:EIP=0008:8013D7AE   SS:ESP=0010:8014AB7C
EAX=00000041   EBX=FFDFF000   ECX=00000041   EDX=80010031
ESI=80147940   EDI=80147740   EBP=FFDFF600   EFL=00000246
DS=0023   ES=0023   FS=0030   GS=0000

CR0=8000003F PE MP EM TS ET NE PG
CR2=C13401D6
CR3=00030000
CR4=00000011 VME PSE
DR0=00000000
DR1=00000000
DR2=00000000
DR3=00000000
DR6=FFFF0FF0
DR7=00000400
EFL=00000246 PF ZF IF IOPL=0
```

The following example lists the sample output from the CPU command under the Windows NT family on a system that uses an I/O APIC:

```
Processor 00 Registers
----------------------
CS:EIP=0008:8013D7AE   SS:ESP=0010:8014AB7C
EAX=00000041   EBX=FFDFF000   ECX=00000041   EDX=80010031
ESI=80147940   EDI=80147740   EBP=FFDFF600   EFL=00000246
DS=0023   ES=0023   FS=0030   GS=0000

CR0=8000003F PE MP EM TS ET NE PG
CR2=C13401D6
CR3=00030000
CR4=00000011 VME PSE
DR0=00000000
DR1=00000000
DR2=00000000
DR3=00000000
DR6=FFFF0FF0
DR7=00000400
EFL=00000246 PF ZF IF IOPL=0

--------Local apic--------
                   ID: 0
              Version: 30010
        Task Priority: 41
 Arbitration Priority: 41
   Processor Priority: 41
   Destination Format: FFFFFFFF
  Logical Destination: 1000000
      Spurious Vector: 11F
    Interrupt Command: 3000000:60041
          LVT (Timer): 300FD
          LVT (Lint0): 1001F
          LVT (Lint1): 84FF
          LVT (Error): E3
          Timer Count: 3F94DB0
        Timer Current: 23757E0
         Timer Divide: B
```

The following example lists the sample output from the CPU -i command under the Windows NT family on a system that uses an I/O APIC:

```
Inti  Vector  Delivery   Status  Trigger  Dest Mode
Destination
01     91     Low. Pri   Idle     Edge     Logical     01000000
03     61     Low. Pri   Idle     Edge     Logical     01000000
04     71     Low. Pri   Idle     Edge     Logical     01000000
08     D1     Fixed      Idle     Edge     Logical     01000000
0C     81     Low. Pri   Idle     Edge     Logical     01000000
0E     B1     Low. Pri   Idle     Edge     Logical     01000000
I/O unit id register: 0E000000
I/O unit version register: 000F0011
```

See Also

PAGE

CR

OS

Windows 3.1

Type

System Information

Definition

Display the control registers.

Syntax

CR

Use

The CR command displays the contents of the three control registers (CR0, CR2, and CR3), and the debug registers in the Command window. CR0 is the processor control register. CR2 is the register in which the processor stores the most recently accessed address that resulted in a page fault. CR3 contains the *physical* address of the system's page directory. (Refer to *PACKET* on page 236.)

Example

The following example lists the sample output from a CR command:

```
CR0=8000003B PE MP TS ET NE PG
CR2=000CC985
CR3=002FE000
CR4=00000008 DE
DR1=00000000
DR2=00000000
DR3=00000000
DR6=FFFF0FF0
DR7=00000400
```

See Also

PAGE

CSIP

OS

Windows 3.1

Type

Breakpoints

Definition

Set the instruction pointer (CS:EIP) memory range qualifier for all breakpoints.

Syntax

CSIP [**off** | [**not**] ***start-address end-address*** | [**not**] ***module-name***]

off	Turns off CSIP checking.
not	Breakpoint only occurs if the CS:EIP is outside the specified range or module.
start-address	Beginning of memory range.
end-address	End of memory range.
module-name	If you specify a valid Windows module-name instead of a memory range, the range covers all code areas in the specified Windows module.

Use

For Windows 3.1

The CSIP command qualifies breakpoints so that the code that triggers the breakpoint must come from a specified memory range. This function is useful when a program is suspected of accidentally modifying memory outside of its boundaries.

When breakpoint conditions are met, the instruction pointer (CS:EIP) is compared to the specified memory range. If the instruction pointer is within the range, the breakpoint activates. To activate the breakpoint only when the instruction pointer (CS:EIP) is outside the range, use the NOT parameter.

Since 16-bit Windows programs are typically broken into several code segments scattered throughout memory, you can input a Windows module name as the range. If you enter a module name, the range covers all code segments in the specified Windows program or DLL.

When you specify a CSIP range, it applies to ALL breakpoints that are currently active.

If you do not specify parameters, the current memory range displays.

For Windows 9x and Windows NT family

CSIP still works for 16-bit code and modules. For 32-bit code, this command is obsolete. Use conditional expressions to achieve this functionality.

Example

The following command causes breakpoints to occur only if the CS:EIP is NOT in the ROM BIOS when the breakpoint conditions are met.

```
CSIP not $f000:0 $ffff:0
```

The following command causes breakpoints to occur only if the Windows program CALC causes them.

```
CSIP calc
```

D

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Display/Change Memory

Definition

Display memory.

Syntax

For Windows 3.1

`D[size] [address]`

For Windows 9x and the Windows NT family

`D[size] [-p] [address [l length]]`

size

Value	Description
B	Byte (8-bits)
W	Word (16-bits)
D	Double Word (32-bits)
S	Short Real (32-bits)
L	Long Real (64-bits)
T	10-Byte Real (80-bits)

-p Indicates that *address* is a physical address rather than a virtual one.

address Starting address of the memory you want to display.

l *length* Displays *length* number of bytes to the Command window.

Use

The D command displays the memory contents at the specified address.

SoftICE displays the memory contents in the format you specify in the *size* parameter. If you do not specify a size, SoftICE uses the last size specified. For the byte, word, and double word hexadecimal formats, the ASCII representation is displayed.

The D command displays data either in the active data window, or if there is no data window open, the command window. If the data is displayed in the command window, the D command will display 8 lines of data by default.

If you do not specify an address, the command displays memory at the next sequential address after the last byte displayed in the current data window.

The *address* parameter may be any virtual address in the system. Selector overrides are allowed; if you do not specify a selector as part of the address, SoftICE will use the last selector specified (in practice, the selector can usually be ignored in a flat address environment). If you need to display a physical address, you can use the –p switch. Physical address space is flat, not segmented, so when displaying physical addresses the D command will show PHYS: in place of the selector.

If an L parameter followed by a length is specified, SoftICE displays the requested number of bytes to the Command window regardless of whether the Data window is visible. SoftICE always displays whole rows. If the length would result in a fractional row, SoftICE rounds up. This form of the D command is useful when dumping large amounts of data to the command window for the purpose of writing it to a log file.

For floating point values, numbers display in the following format:

```
[leading sign] decimal-digits . decimal-digits E sign exponent
```

The following ASCII strings can also display for real formats:

String	Exponent	Mantissa	Sign
Not A Number	all 1’s	NOT 0	+/-
Denormal	all 0’s	NOT 0	+/-
Invalid	10 byte only with mantissa=0		
Infinity	all 1's	0	+/-

Example

Displays the memory starting at address DS:F1479000 in byte format and in ASCII format:.

```
DB ds:F1479000
```

The following command displays 4KB of memory starting at address SS:ESP in dword format. The data is displayed in the Command window.

```
DD ss:esp l 1000
```

The following command displays memory starting at physical address 1158D000 in word format. Note that the physical addresses are flat; selector values are not used..

```
DW -p 1158D000
```

See Also

DATA; WD; Chapter 4 of *Using SoftICE*.

DATA

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Windows 3.1: F12

Definition

Display another Data window.

Syntax

DATA [***window-number***]

window-number	Number of the Data window you want to view. This can be 0, 1, 2, or 3.

Use

SoftICE supports up to four Data windows. Each Data window can display a different address and/or format. Only one Data window is visible at any time. Specifying DATA without a parameter just switches to the next Data window. The windows are numbered from 0 to 3. This number displays on the righthand side of the line above the Data window. If you specify a window-number after the DATA command, SoftICE switches to display that window. The DATA command is most useful when assigned to a function key. See Chapter 10, “Customizing SoftICE,” in the *Using SoftICE* manual.

Example

The following command changes the visible Data window to Data window number 3.

```
DATA 3
```

DETACH

OS

Windows NT family

Type

Customization

Definition

Disassociates a user environment from the current environment.

Syntax

DETACH

Use

When a user has "attach"ed to an environment upon popup, the debugging environment will be overridden by that defined with "attach." When you issue the “detach” command, you allow SoftICE to go back into automatic mode and choose the environment that is appropriate for SoftICE popups. This means that address contexts and tables will be automatically chosen at the time of the SoftICE popup.

Example

The following command disassociates a user environment from the current environment.

```
DETACH
```

DEVICE

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display system information on Windows 9x and Windows NT family devices.

Syntax

DEVICE [***device-name*** | ***pdevice-object***]

device-name	Object directory name of the device.
pdevice-object	Object address of the device.

Use

The DEVICE command displays information on Windows device objects. If the DEVICE command is entered without parameters, summary information displays for all device objects found in the \Device directory. However, if a specific device object is indicated, either by its object directory name (device-name) or object address (pdevice-object), more detailed information displays.

If a directory is not specified with a device-name, the DEVICE command attempts to locate the named device object in the entire object tree. When displaying information about a specified device, the DEVICE command displays fields of the DEVICE_OBJECT data structure as defined in NTDDK.H.

Output

The following fields are shown as summary information:

RefCnt	Device object's reference count.
DrvObj	Pointer to the driver object that owns the device object.
NextDev	Pointer to the next device object on the linked list of device objects that were created by the same driver.

AttDev	Pointer to a device object that has been attached to the displayed object via an IoAttachDeviceObject call. Attached device objects are essentially IRP filters for the devices to which they are attached.
CurIrp	Pointer to the IRP currently being serviced for the device object by the device object's driver.
DevExten	Pointer to device driver-defined device object extension data structure.
Name	Name of the device, if it has one.

The following are some fields shown when detailed information is printed:

Flags	Definition of the device object's attributes such as whether I/O performed on the device is buffered or not.
Vpb	Pointer to the device's associated volume parameter block.
Device Type	User-defined or pre-defined value that SoftICE translates to a name.

Example

The following example shows the DEVICE command output with no parameters. It results in SoftICE printing summary information on all device objects in the \Device object directory.

```
DEVICE

RefCnt   DrvObj   NextDev  AttDev   CurIrp   DevExten Name
00000000 FD8CD910 00000000 00000000 00000000 FD8CD868 Beep
00000015 FD89E730 00000000 00000000 00000000 FD89C968 NwlnkIpx
00000001 FD892170 00000000 00000000 00000000 FD8980E8 Netbios
00000000 FD89D730 00000000 00000000 00000000 FD897D68 Ip
00000001 FD8CBB70 00000000 00000000 FD8DAA08 FD8CAF88 KeyboardClass0
00000001 FD8C9F30 00000000 00000000 00000000 FD8C60F0 Video0
00000001 FD8C9C90 00000000 00000000 00000000 FD8C50F8 Video1
00000001 FD8CC530 00000000 00000000 FD8DAC08 FD8CBF88 PointerClass0
00000001 FD8DB550 FD8D3030 00000000 00000000 FD8D3FC8 RawTape
00000007 FD89D730 FD897CB0 00000000 00000000 FD897C48 Tcp
00000001 FD88A990 00000000 00000000 00000000 FD88A8A8 ParallelPort0
00000003 FD8B3730 00000000 00000000 00000000 FD8A40E8 NE20001
```

The following example uses the DEVICE command with the BEEP device object's name.

```
DEVICE beep
RefCnt   DrvObj   NextDev  AttDev   CurIrp   DevExten Name
00000000 FD8CD910 00000000 00000000 00000000 FD8CD868 Beep
Timer*                 : 00000000
Flags                  : 00000044 DO_BUFFERED_IO |
DO_DEVICE_HAS_NAME
Characteristics        : 00000000
Vpb*                   : 00000000
Device Type            : 1        FILE_DEVICE_BEEP
StackSize              : 1
&Queue                 : FD8CD7E4
AlignmentRequirement: 00000000 FILE_BYTE_ALIGNMENT
&DeviceQueue           : FD8CD810
&Dpc                   : FD8CD824
ActiveThreadCount      : 00000000
SecurityDescriptor* : E10E2528
&DeviceLock            : FD8CD84C
SectorSize             : 0000
Spare1                 : 0000
DeviceObjectExtn*      : FD8CD8B8
Reserved*               : 00000000
```

DEX

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Display or assign a Data window expression.

Syntax

DEX [***data-window-number*** [***expression***]]

data-window-number	Number from 0 to 3 indicating which Data window to use. This number displays on the righthand side of the line above the Data window.
expression	Data expression to assign to the Data window.

Use

The DEX command assigns a data expression to any of the four SoftICE Data windows. Every time SoftICE pops up, the expressions are re-evaluated and the memory at that location displays in the appropriate Data window. This is useful for displaying changing memory locations where there is always a pointer to the memory in either a register or a variable. The data displays in the current format of the Data window: either byte, word, dword, short real, long real, or 10-byte real. This command is the same as entering the command D expression every time SoftICE pops up.

If you type DEX without parameters, it displays all the expressions currently assigned to the Data windows.

To unassign an expression from a Data window, type DEX followed by the data-window-number, then press Enter.

To cycle through the four Data windows, use the DATA command. (Refer to *DATA* on page 82.)

Example

Every time SoftICE pops up, Data window 0 contains the contents of the stack.

```
DEX 0 ss:esp
```

Every time SoftICE pops up, Data window 1 contains the contents of the memory pointed to by the public variable PointerVariable.

```
DEX 1 @pointervariable
```

See Also

DATA

DIAL

OS

Windows 9x and the Windows NT family

Type

Customization

Definition

Redirect console to modem.

Syntax

`DIAL` [**`on`** [***`com-port`***] [***`baud-rate`***] [**`i=`*****`init-string`***] [**`p=`*****`number`***] | **`off`**]

com-port	If no com-port is specified, the default is COM1.
baud-rate	Baud-rate to use for modem communications. The default is 38400. The rates you can specify are 1200, 2400, 4800, 9600, 19200, 23040, 28800, 38400, 57000, and 115000.
i=init-string	Optional modem initialization string.
p=number	Telephone number.

Use

The DIAL command initiates a call to a remote machine via a modem. The remote machine must be running SERIAL32.EXE (SERIAL.EXE on an MSDOS machine) and be waiting for a call. Once a connection is established, SoftICE input is received from the remote machine and SoftICE output is sent to the remote machine. No input is accepted from the local machine except for the pop-up hot key sequence. For a detailed explanation of this procedure, refer to Chapter 9, “Using SoftICE with a Modem” in the *Using SoftICE* manual.

You can specify the modem initialization string and phone number within the SoftICE configuration settings, so that the strings they specify become the defaults for the i and p command-line parameters. Refer to Chapter 10, “Customizing SoftICE” in the *Using SoftICE* manual.

On the remote machine, you can use the SERIAL command to specify the com-port, baud-rate, and init parameters for SERIAL.EXE.

Example

The following is an example of the DIAL command:

```
DIAL on 2 19200 i=atx0 p=9,555-5555,,,1000
```

This command tells SoftICE to first initialize the modem on com-port 2 at a baud rate of 19200 with the string, “atx0,” and then to make a call through the modem to the telephone number 9-555-5555 extension 1000. Commas can be used in the phone number, just as with traditional modem software, to insert delays into the dialing sequence.

The following example shows the syntax expected by SERIAL.EXE when running it on a remote machine so that it answers a DIAL command from the local machine.

```
SERIAL on [com-port] [baud-rate] i"init-string"
```

The following SERIAL.EXE command-line uses a modem initialization string of “atx0” to answer a call (at 19200 bps) through a modem on the remote machine’s COM1 serial port. The command line is entered on the remote machine.

```
SERIAL on 1 19200 i"atx0"
```

When the remote debugging session is complete, enter the DIAL OFF command from the remote machine to terminate the debugging session and hang up the modem.

The following are examples of the Dial initialization and Phone number strings in the Remote Debugging SoftICE configuration settings:

```
Dial initialization string: atx0

Telephone number string: 9,555-5555,,,1000
```

With this Dial initialization string in place, SoftICE always initializes the modem specified in DIAL commands with “ATX0”, unless the DIAL command explicitly specifies a different initialization string.

With this Phone initialization string in place, SoftICE always dials the specified number when executing DIAL commands, unless the DIAL command explicitly specifies a different phone number.

See Also

ANSWER, SERIAL, and Chapter 10, “Customizing SoftICE” in the *Using SoftICE* manual.

DPC

OS

Windows NT family

Type

System Information

Definition

Display Deferred Procedure Calls.

Syntax

DPC [***address***]

address	Location of a delayed procedure call.

Use

The DPC command displays information about deferred procedure calls that are current in the system. If you enter DPC without parameters, SoftICE list all delayed procedure call that are queued for delivery in the system. For each DPC, SoftICE lists the following information:

If you provide the address of a particular DPC, SoftICE displays the following information for that DPC:

Example

The following command displays a listing of all deferred procedure calls current in the system.

```
DPC
```

See Also

APC

DRIVER

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display information on Windows 9x and Windows NT family drivers.

Syntax

`DRIVER` `[`***`driver-name`***` | `***`pdriver-object`***`]`

driver-name	Object directory name of the driver.
pdriver-object	Object address of the driver.

Use

The DRIVER command displays information on Windows 9x and Windows NT family drivers. If the DRIVER command is entered without parameters, summary information is shown for all drivers found in the \Driver directory. However, if a specific driver is indicated, either by its object directory name (driver-name), or by its object address (pdriver-object), more detailed information is displayed.

If a directory is not specified with the driver-name, the DRIVER command attempts to locate the named driver in the entire object tree. When displaying detailed information about a specified driver, the DRIVER command displays the fields of the DRIVER_OBJECT data structure as defined in NTDDK.H.

Output

The following fields are shown as summary information:

Start	Base address of the driver.
Size	Driver’s image size.
DrvSect	Pointer to driver module structure.
Count	Number of times the registered reinitialization routine has been invoked for the driver.

DrvInit	Address of the driver's DriverEntry routine.
DrvStaIo	Address of the driver's StartIo routine.
DrvUnld	Address of the driver's Unload routine.
Name	Name of the driver.

The following is shown when detailed information is printed:

DeviceObject	Pointer to the first device object on the driver's linked list of device objects that it owns.
Flags	Field is a bit-mask of driver flag. The only flag currently documented is DRVO_UNLOAD_INVOKED.
FastIoDispatch	Pointer to the driver's fast I/O dispatch data structure, if it has one. File System Drivers typically have a fast I/O routines defined for them. Information on the structure can be found in NTDDK.H.
Handler Addresses	Upon initialization, driver's can register handlers that are called when the driver receives specific IRP request types. Each handler address is listed along with the IRP major function it processes for the driver.

Example

The following example shows the output of the DRIVER command with no parameters. This results in SoftICE printing summary information on all the drivers in the \Driver object directory.

```
DRIVER

Start    Size     DrvSect  Count    DrvInit  DrvStaIo DrvUnld  Name
FB030000 00000E20 FD8CDA88 00000000 FB0302EE FB0305E8 FB0306E2 Beep
FB130000 0000D3A0 FD89E8C8 00000000 FB13B7BF 00000000 FB136789 NwlnkIpx
FB050000 00002320 FD8CD1A8 00000000 FB050AF2 FB0508BE 00000000 Mouclass
FB060000 00002320 FD8CBC48 00000000 FB060AF2 FB0608C0 00000000 Kbdclass
FB070000 00003860 FD8CAE48 00000000 FB070B0C 00000000 00000000 VgaSave
```

The following is an example of the DRIVER command with the BEEP.SYS driver object's name as a parameter. From the listing it can be seen that the driver's first device object is at FD8CD7B0h, and that it has 4 IRP handler routines registered.

```
DRIVER beep
Start    Size     DrvSect  Count    DrvInit  DrvStaIo DrvUnld
Name
FB030000 00000E20 FD8CDA88 00000000 FB0302EE FB0305E8
FB0306E2 Beep
DeviceObject*     : FD8CD7B0
Flags             : 00000000
HardwareDatabase :
\REGISTRY\MACHINE\HARDWARE\DESCRIPTION\SYSTEM
FastIoDispatch*   : 00000000
IRP_MJ_CREATE                      at 8:FB03053C
IRP_MJ_CLOSE                       at 8:FB03058A
IRP_MJ_DEVICE_CONTROL              at 8:FB0304C6
IRP_MJ_CLEANUP                     at 8:FB030416
```

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Display/Change Memory

Definition

Edit memory.

Syntax

E[***size***] [***address*** [***data-list***]]

size

Value	Description
B	Byte
W	Word
D	Double Word
S	Short Real
L	Long Real
T	10-Byte Real

address

data-list List of data objects of the specified size (bytes, words, double words, short reals, long reals, or 10-byte reals) or quoted strings separated by commas or spaces. The quoted string can be enclosed with single quotes or double quotes.

Use

If you do not specify data-list, the cursor moves into the Data window where you can edit the memory in place. If you specify a data-list, the memory is immediately changed to the new values.

If the Data window is not currently visible, it is automatically made visible. Both ASCII and hexadecimal edit modes are supported. To toggle between the ASCII and hexadecimal display areas, press the Tab key.

If you do not specify a size, the last size used is assumed.

Enter valid floating point numbers in the following format:

`[`*`leading sign`*`]` *`decimal-digits`* `.` *`decimal-digits`* `E` *`sign exponent`*

Example: `A valid floating point number is -1.123456 E-19`

Example

The following command moves the cursor into the Data window for editing. The starting address in the Data window is at DS:1000h, and the data displays in hexadecimal byte format as well as in ASCII. The initial edit mode is hexadecimal.

```
EB ds:1000
```

The next command moves the null terminated ASCII string ’Test String’ into memory at location DS:1000h.

```
EB ds:1000 ‘Test String’,0
```

This command moves the short real number 3.1415 into the memory location DS:1000h.

```
EB ds:1000 3.1415
```

EC

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

F6

Definition

Enter or exit the Code window.

Syntax

EC

Use

The EC command toggles the cursor between the Code window and the Command window:

- If the cursor is in the Command window, it moves to the Code window.
- If the cursor is in the Code window, it moves to the Command window.
- If the Code window is not visible when the command is entered, it is made visible.

When the cursor is in the Code window, several options become available that make debugging much easier. These options are as follows:

- Set "point-and-shoot" breakpoints
  Set these with the BPX command. If you do not specify parameters with the BPX command (default key F9), an execution breakpoint is set at the location of the cursor position in the Code window.
- Go to cursor line
  Set a temporary breakpoint at the cursor line and begin executing with the HERE command (default key F7).
- Scroll the Code window
  The scrolling keys (UpArrow, DownArrow, PageUp and PageDn) are redefined while the cursor is in the Code window:
  - UpArrow: Scroll Code window up one line.

- ◇ DownArrow: Scroll Code window down one line.
- ◇ PageUp: Scroll Code window up one window.
- ◇ PageDn: Scroll Code window down one window.

Source Mode Only

In source mode, you can scroll the Code window from the Command window using the CTRL key with one of cursor keys described above. In this mode, the following keys also have special meaning:

- CTRL-Home: Moves to line 1 of current source file.
- CTRL-End: Moves to the last line of the current source file.

Note: The previous keys only work for source display, not for disassembled instructions.

- CTRL-RightArrow: Horizontal scroll of source code right.
- CTRL-LeftArrow: Horizontal scroll of source code left.

ERESOURCE

OS

Windows NT family

Type

System Information

Definition

Display information about the synchronization resources contained in ExpSystemResourceList.

Syntax

ERESOURCE [-a | -c | -w | address]

-a	Display resources that are actively held by any thread.
-c	Display resources that are or have been under contention (where contention count > 0).
-w	Display resources that have threads currently waiting on them.
address	Address of an ERESOURCE structure.

Use

This command displays the ERESOURCE structure, a list of the threads that currently own the ERESOURCE, and a list of the threads that are waiting on the ERESOURCE.

When you do not specify an address, SoftICE displays summary information about every ERESOURCE structure in ExpSystemResourceList.

Example

Enter the following command to display a list of the active resources on your system.

```
ERESOURCE -a
```

You can enter the following command to get extended information about a specific ERESOURCE structure, including thread contentions and threads waiting on the ERESOURCE.

```
ERESOURCE address
```

You can use the information you get from the commands above in combination with the following command to help find deadlocks.

```
ERESOURCE -w
```

See Also

KEVENT; KSEM; THREAD

EVENT

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Displays BoundsChecker® events.

Syntax

```
EVENT [-? | -a | -d | -lx | -nd | -o | -pd | -r | -s | -t | -x]
      [start-event-index [L event-count]]
```

-? Displays descriptions of the supported command switches.

-a Turns API return display on or off. The default setting is on. When this is off, SoftICE does not display API return events.

-d Lists all drivers currently being monitored by BoundsChecker. Type **Event-d** at the SoftICE Command Prompt to see a listing of these drivers and the total count.

-lx Specifies the stack-checking level (0x40 - 0x4000). The default setting is 0x800.

-nd Specifies the nesting depth used to display events. Legal values are 0 to 32 (decimal format). The default nesting level is 10. If events nest past the specified nesting depth, SoftICE does not display them as indented.

-o Turns event logging on or off. The default setting is on.

-pd Specifies the SoftICE pop-up level for BoundsChecker events. The default setting is 0.

0 - SoftICE does not pop up on BoundsChecker events.

1 - SoftICE pops up on errors only.

2 - SoftICE pops up on all errors and warnings.

-r Clears the event buffer.

-s Displays the current status of event viewing and logging. The number of logged events is the total that have been trapped since the system was started. It is displayed in decimal format.

-t	Turns display of thread switches on or off. The default setting is on. When this option is on and event n-1 is in a different thread than event n, SoftICE displays event n in reverse video indicating a thread switch has occurred. When this option is off, SoftICE does not display thread switches.
-x	Displays all events with their parameters, as well as general summary information for each event, including elapsed time, current thread and current IRQL. If you do not specify this switch, SoftICE displays a single summary line for each event.
start-event-index	Displays events starting at the specified event index.
Levent-count	Displays the logged events in the Command window, starting from the specified start-event-index for a length of event-count events. If you do not specify a length, SoftICE displays the events in a scrollable window starting from start-event-index (if one is specified).

Use

Use the EVENT command to display information about BoundsChecker events. You can display event information in the Event window or in the Command window.

Viewing Events in the Event Window

You can specify whether SoftICE displays the events in the Event window with summary or detail information. While the Event window is open, you can use F1 to expand or collapse all events. You can place the cursor on a line and double-click or press Enter to expand or collapse a single event.

The Event window supports the following keys.

Enter	Toggles the display state of the event at the current cursor position between summary information and detail information.
Esc	Closes the Event window. When you re-open the Event window, SoftICE preserves the previous window state (i.e. current event, expansion state, and filters are the same).
PageUp	Scrolls the screen up one page.
PageDown	Scrolls the screen down one page.
Up Arrow	Moves cursor up one line. If on the top line, it scrolls the window up one line.
Down Arrow	Moves cursor down one line. If on bottom line, it scrolls window down one line.
Shift-Left Arrow	Scrolls the window left one column.
Shift-Right Arrow	Scrolls the window right one column.

Home	Moves the cursor to the top row. If the cursor is already on the top row, starts display at the first event.
End	Moves the cursor to the bottom row. If the cursor is already on the bottom, starts display at the last event.
*	Undoes the last Home or End operation.
F1	Toggles the display state of all events between summary information and detail information.
F2	Displays the Event filtering dialog.
F3	Displays the Parameter filtering dialog.
F4	Displays error events only.
F	Closes the Event window and returns focus to the Command window. Use this key if you want to use other SoftICE commands on data that is displayed in the Event window. If you bring up the Event window again, SoftICE preserves the previous window state (i.e. current top event, expansion state, and filters are the same).
R	Toggles the display state of API returns between showing all API returns and showing no API returns.
T	Toggles the highlighting of thread switches. Thread switches are indicated by displaying the summary line of the first event in the new thread in reverse video.
E	Toggles the highlighting of errors on API returns. SoftICE displays the summary line of API return errors in bold.
S	Displays the event at the current cursor position at the top of the Event window.
N	Finds the next event that matches the search criteria selected with the right mouse button.
P	Finds the previous event that matches the search criteria selected with the right mouse button.
0 - 7	Filters events by CPU number on SMP machines. Each key acts as a toggle for displaying all events that occurred on a specific CPU. These keys also appear as buttons on the top line of the Event window.

Viewing Events in the Command Window

In the Command window, SoftICE can display any number of events starting from any specific event index. SoftICE can display the events with summary or detail information. The summary display includes only a single line for each event. The detail display includes the summary information, as well as all event parameters. You can use the EVENT command switches to customize the display output.

It is useful to view events in the Command window when you want to view a small group of functions, or when you want to save the event data to a SoftICE History file. A SoftICE History file contains current contents of the SoftICE history buffer. You can use the scroll bars in the Command window to view the contents of the SoftICE history buffer.

Example

Enter the following command at the command prompt to display events in the Event window.

```
EVENT
```

When you do not specify *start-event-index* or *event-count*, SoftICE displays the Event window in place of the Command window. You can use this command with one of the EVENT command switches or with a *start-event-index* to customize the display.

Enter the following command at the command prompt to display events in the Command window starting at event *start-event-index* for a length of *event-count* events.

```
EVENT start-event-index Levent-count
```

See Also

EVMEM; Chapter 2, “Using BoundsChecker Driver Edition,” in the *Using DriverStudio Tools* document.

EVMEM

OS

Windows NT family

Type

System Information

Definition

Display information about BoundsChecker memory events.

Syntax

EVMEM [-? | -d | -t | -s | -p | -o | -e] [tag | driver-name | pool-type]

-?	Displays descriptions of the supported command switches.
-d	Sorts the output by driver name.
-t	Sorts the output by tag.
-s	Sorts the output by size.
-p	Sorts the output by pool type.
-o	Displays overview information.
-e	Displays only error events.
tag	Displays only memory events that were allocated with that specific tag. Tags are 4 byte ASCII strings that are passed to the ExAllocatePoolWithTag API.
driver-name	Displays memory events for only the specified driver.
pool-type	Displays only memory events allocated out of that specific pool. The following values are valid.

NPP	Non-paged pool
PP	Pageable pool
NPPMS	Non-paged pool, must succeed
NPPCA	Non-paged pool cache aligned
PPCA	Pageable pool cache aligned
NPPCAMS	Non-paged pool cache aligned, must succeed
MMC	Allocated by MMAllocateContiguousMemory API
MMNC	Allocated by MMAllocateNonCachedMemory API

Use

Use the EVMEM command to display information about BoundsChecker memory events in the Command window.

To display information about all types of events, use the EVENT command.

Example

Enter the following command at the command prompt to display memory events in the Command window.

```
EVMEM
```

You can use the EVMEM command switches to customize the display, including sorting the output and displaying additional information.

Enter the following command at the command prompt to display events in the Command window for driver-name:

```
EVMEM driver-name
```

See Also

EVENT

EVRES

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Displays resources collected by the BoundsChecker driver BCHKD.SYS.

Syntax

EVRES [Process-Type | Object-Type | Driver-Type]

Process-Type	A Process-Type is a process name, a PID, or a PCB address. If one is specified, only objects created in that process will be displayed. Use this version of the command to display only objects created in the system process: EVRES system
Object-Type	An Object-Type is one of the following: KEY DIRECTORY INTERRUPT FILE SECTION EVENT These refer to the types of objects collected by BCHKD. If one is specified, only the objects of that type will be displayed. Use this version of the command to display interrupt objects: EVRES interrupt
Driver-Type	A Driver-Type is a driver name. If one is specified, only resources created by that driver will be displayed. Use this version of the command to display resources created by the netbios driver: EVRES netbios

Note: If no parameters are entered, all resources will be displayed.

For each captured resource, the following information will be displayed:

- **Handle** – This is the object handle of the resource. For interrupt objects, it is the address of the interrupt object structure.

- **Process** – This is the process name and process id where the resource was created.
- **Obj Type** – This is one of the object types listed above.
- **Name** – This is the resource name. For interrupt objects, this is the interrupt vector number and the interrupt service routine address.
- **EIP1** – This is the address in the driver that created the resource. If a symbolic name is available, it will be displayed; otherwise, the address and the driver name plus an offset will be displayed.
- **EIP2** – This is the second level of return address on the stack. If a symbolic name is available, it will be displayed; otherwise, the address and the driver name plus an offset will be displayed.

Use

Use the EVRES command to display resources collected by the BoundsChecker driver BCHKD.SYS.

Example

The following is a sample of the output of an EVRES command:

```
Handle        Process(PID)  Obj Type        Name
8147A768      System(08)    INTERRUPT  Vec:51 ISR:ED0907A5
                            EIP1: ED092F20 serial!PAGESRP0+0720
                            EIP2: 00000000
8147AA28      System(08)    INTERRUPT  Vec:A2 ISR:ED0907A5
                            EIP1: ED092F20 serial!PAGESRP0+0720
                            EIP2: 00000000
8147B008      System(08)    INTERRUPT  Vec:52 ISR:ED086D10
                            EIP1: ED083526 i8042prt!PAGE+0406
                            EIP2: ED0844F1 i8042prt!PAGE+13D1
8155C628      System(08)    INTERRUPT  Vec:B3 ISR:ED0810CC
                            EIP1: ED08360D i8042prt!PAGE+04ED
                            EIP2: ED0844DA i8042prt!PAGE+13BA
8155C008      System(08)    INTERRUPT  Vec:93 ISR:ED3124BC
                            EIP1: ED316D70 uhcd!PAGE+0B50
                            EIP2: ED310FB3 uhcd!.text+0CD3
81579008      System(08)    INTERRUPT  Vec:83 ISR:BFEBC591
                            EIP1: BFEC360B
                            NDIS!NdisInitializeInterrupt+0179
                            EIP2: BFEC348B
                            NDIS!NdisMRegisterInterrupt+0035
```

```
818AB008     System(08)    INTERRUPT  Vec:92 ISR:BFF27E28
                           EIP1: BFF300C4 atapi!PAGE+0AA4
                           EIP2: BFF2FF37 atapi!PAGE+0917
818AB408     System(08)    INTERRUPT  Vec:92 ISR:BFF27E28
                           EIP1: BFF300C4 atapi!PAGE+0AA4
                           EIP2: BFF2FF37 atapi!PAGE+0917
818ABC68     System(08)    INTERRUPT  Vec:72 ISR:BFF27E28
                           EIP1: BFF300C4 atapi!PAGE+0AA4
                           EIP2: BFF2FF37 atapi!PAGE+0917
818AB008     System(08)    INTERRUPT  Vec:71 ISR:BFF27E28
                           EIP1: BFF300C4 atapi!PAGE+0AA4
                           EIP2: BFF2FF37 atapi!PAGE+0917
814D5008     System(08)    INTERRUPT  Vec:B1 ISR:BFF7F44Av
                           EIP1: BFF8FF8E ACPI!PAGE+08CE
                           EIP2: BFF97403 ACPI!PAGE+7D43
Total Resource Objects:
10
```

See Also

EVENT; EVMEM

EXIT

OS

Windows 3.1

Type

Flow Control

Definition

Force an exit of the current MS-DOS or Windows 3.1 program.

Syntax

EXIT

Use

The EXIT command attempts to abort the current MS-DOS or Windows 3.1 program by forcing a DOS exit function (INT 21h, function 4Ch). This command only works if MS-DOS is in a state where it is able to accept the exit function call. If this call is made from certain interrupt routines, or other times when MS-DOS is not ready, the system may behave unpredictably. Only use this call when SoftICE pops up in VM mode, or 16- or 32-bit protected mode, running at ring 3. In 32-bit, ring 0 protected mode code, an error displays.

Caution

Use the EXIT command with care. Since SoftICE can be popped up at any time, a situation can occur in which MS-DOS is not in a state to accept an exit function call. Also, the EXIT command does not reset any program-specific settings.

Note: The EXIT command does not reset the video mode or interrupt vectors. For Windows programs, the EXIT command does not free resources.

If running under WIN32s, the EXIT command sometimes causes WIN32s to display a dialog box with the message “Unhandled exception occurred.” Press OK to terminate the application.

For Windows 9x and the Windows NT family

EXIT is no longer supported.

Example

The following command causes the current MS-DOS or Windows 3.1 program to exit.

```
EXIT
```

EXP

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Display export symbols from DLLs.

Syntax

EXP [[**module!**][***partial-name***]] | [**!**]

module!	Display exports from the specified module only.
partial-name	Export symbol or the first few characters of the name of an export symbol. The ? character can be used as a wildcard character in place of any character in the export name.
!	Display list of modules for which SoftICE has exports loaded.

Use

Use the EXP command to show exports from Windows DLLs, Windows NT family drivers, and 16-bit drivers (.DRV extension) for which SoftICE has exports loaded. To tell SoftICE which DLLs and drivers to load, set the SoftICE initialization settings for Exports in Symbol Loader.

The module and name parameters can be used to selectively display exports only from the specified module, and/or exports that match the characters and wildcards in the name parameter. When exports are displayed, the module name is printed first on a line by itself, and the export names and their addresses are printed below it.

Note: Since DLLs and drivers run in protected mode, the addresses are protected mode addresses.

This command is valid for both 16-bit and 32-bit DLLs with 16-bit exports being listed first.

For Windows 3.1

SoftICE automatically loads exports for KERNEL, USER, and GDI.

For Windows 9x

SoftICE automatically loads exports for KERNEL, USER, and GDI. The SoftICE Loader can dynamically load 32-bit exported symbols.

For the Windows NT family

SoftICE automatically loads exports for KERNEL32, USER32, and GDI32. The SoftICE loader can dynamically load 32-bit exported symbols.

Example

The following example of the EXP command displays all exports that begin with the string DELETE. The output shows that KERNEL.DLL has 3 exports matching the string: DELETEATOM, DELETEFILE, and DELETEPATHNAME. These routines are located at 127:E3, 11F:7D4 and 127:345A, respectively. Following the exports from KERNEL are the exports from USER and GDI, and following these begin the 32-bit exports.

```
EXP delete

KERNEL
   0127:00E3 DELETEATOM011F:07D4 DELETEFILE
   0127:345A DELETEPATHNAME

USER
   176F:0C88 DELETEMENU

GDI
   0527:0000 DELETEMETAFILE04B7:211C DELETESPOOLPAGE
   047F:55FD DELETEDC054F:0192 DELETEPQ
   047F:564B DELETEOBJECT04B7:226E DELETEJOB
   0587:A22E DELETEENHMETAFILE

KERNEL32
0137:BFF97E9B DeleteAtom0137:BFF88636 DeleteCriticalSection
0137:BFF9DC5A DeleteFileA0137:BFFA4C49 DeleteFileW

USER32
0137:BFF62228 DeleteMenu
GDI32
0137:BFF3248F DeleteColorSpace0137:BFF32497 DeleteDC
0137:BFF3248B DeleteEnhMetaFile0137:BFF31111 DeleteMetaFile
0137:BFF3249F DeleteObject
```

The ! character is used to narrow EXP's output to only those modules which are listed on the command line to the left of the !. In the following example, no DLL or driver is specified before the !, so SoftICE simply dumps the names of all the modules for which it has exports loaded.

```
EXP !

KERNEL
USER
GDI
KERNEL32
USER32
GDI32
```

In the following example, the EXP command lists all exports within USER32.DLL that start with “IS.” The ! character is used here to differentiate the module name from the name qualifier.

```
EXP user32!is

USER32
0137:BFF64290 IsCharAlphaA
0137:BFF64256 IsCharAlphaNumericA
0137:BFF61014 IsCharAlphaNumericW
0137:BFF61014 IsCharAlphaW
0137:BFF641E8 IsCharLowerA
0137:BFF61014 IsCharLowerW
0137:BFF64222 IsCharUpperA
0137:BFF61014 IsCharUpperW
0137:BFF61F6A IsChild
0137:BFF6480F IsClipboardFormatAvailable
0137:BFF64D7C IsDialogMessage
0137:BFF64D7C IsDialogMessageA
0137:BFF6101D IsDialogMessageW
0137:BFF618A4 IsDlgButtonChecked
0137:BFF62F12 IsHungThread
0137:BFF64697 IsIconic
0137:BFF623A5 IsMenu
0137:BFF649B9 IsRectEmpty
0137:BFF644BF IsWindow
0137:BFF646E1 IsWindowEnabled
0137:BFF638C4 IsWindowUnicode
0137:BFF64706 IsWindowVisible
0137:BFF646BC IsZoomed
```

See Also

SYMBOL; TABLE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Fill memory with data.

Syntax

`F` ***`address`*** `l` ***`length data-list`***

address	Starting address at which to begin filling memory.
l *length*	Length in bytes.
data-list	List of bytes or quoted strings separated by commas or spaces. A quoted string can be enclosed with single quotes or double quotes.

Use

Memory is filled with the series of bytes or characters specified in the data-list. Memory is filled starting at the specified address and continues for the length specified by the L parameter. If the data-list length is less than the specified length, the data-list is repeated as many times as necessary.

Example

The following example fills memory starting at location DS:8000h for a length of 100h bytes with the string 'Test'. The string 'Test' is repeated until the fill length is exhausted.

```
F ds:8000 l 100 ‘test’
```

FAULTS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Mode Control

Definition

Turn fault trapping on or off.

Syntax

FAULTS [**on** | **off**]

Use

Use the FAULTS command to turn SoftICE processor fault trapping on or off.

Example

The following example turns off fault trapping in SoftICE.

```
FAULTS off
```

See Also

SET

FIBER

OS

Windows NT family

Type

System Information

Definition

Dump a fiber data structure.

Syntax

FIBER [*address*]

address

Use

Use the FIBER command to dump a fiber data structure as returned by CreateFiber(). If you do not specify an address, FIBER dumps the fiber data associated with the current thread. SoftICE provides a stack trace after the dump.

Example

The following example dumps the fiber data associated with the current thread.

```
FIBER
Fiber state for the current thread:
  User data:004565D0  SEH Ptr:01C2FFA8
  Stack top:01C30000   Stack bottom:01C2F000  Stack
limit:01B30000
  EBX=00000001  ESI=005862B8  EDI=004565D0  EBP=01C2FF88
ESP=01C2FC4C
  EIP=63011BAF a.k.a. WININET!.text+00010BAF
=> at 001B:00579720
```

FILE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Change or display the current source file.

Syntax

FILE [[*****]***file-name***]

*	Display all files in the current symbol table.
file-name	Name of file to make current source file.

Use

The FILE command is often useful when setting a breakpoint on a line that has no associated symbol. Use FILE to bring the desired file into the Code window, use the SS command to locate the specific line, move the cursor to the specific line, then enter BPX or press F9 to set the breakpoint.

- If you specify file-name, that file becomes the current file and the start of the file displays in the Code window.
- If you do not specify file-name, the name of the current source file, if any, displays.
- If you specify the * (asterisk), all files in the current symbol table display.

Only source files that are loaded into memory with Symbol Loader or are pre-loaded at initialization are available with the FILE command.

For Windows 9x and the Windows NT family

When you specify a file name in the FILE command, SoftICE switches address contexts if the current symbol table has an associated address context.

Example

Assuming main.c is loaded with the SoftICE Loader, the following command displays the file in the Code window starting with line 1.

```
FILE main.c
```

FKEY

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Show and edit the function key assignments.

Syntax

FKEY [***function-key string***]

function-key

Key	Description
F1 - F12	Unshifted function key
SF1 - SF12	Shifted function key
CF1 - CF12	Control key plus function key
AF1 - AF12	Alternate key plus function key

string Consists of any valid SoftICE commands and the special characters caret (^) and semicolon (;). Place a caret (^) at the beginning of a command to make the command invisible. Place a semicolon (;) in the string in place of Enter.

Use

Use the FKEY command to assign a string of one or more SoftICE commands to a function-key. If you use the command without any parameters, the current function-key assignments display.

Note: You can also edit function key assignments by modifying the SoftICE initialization settings for Keyboard Mappings in Symbol Loader. Refer to the *Using SoftICE* manual for more information about customizing SoftICE.

To unassign a specified function-key, use the FKEY command with the parameters function_key_name followed by null_string.

Use carriage return symbols in a function-key assignment string to assign a series of commands to a function-key. The carriage return symbol is represented by a semi-colon (;).

If you put a caret “^” or press Shift-6 in front of a command name, the command becomes invisible. You can use the command like any other, but all information that normally displays in the Command window (excluding error messages) is suppressed. The invisible mode is useful when a command changes information in a window (Code, Register, or Data), but you do not want to clutter the Command window.

You can also use the plus sign (+) to assign an incomplete command to a function-key. When the function key is pressed, SoftICE displays the partial command in the command line so that the user can complete it.

SoftICE implements the function-keys by inserting the entire string into its keyboard buffer. The function-keys can therefore be used anyplace where a valid command can be typed. If you want a function key assignment to be in effect every time you use SoftICE, initialize the keyboard mappings within your SOFTICE configuration settings. Refer to Chapter 10, “Customizing SoftICE” in the *Using SoftICE* guide.

Example

The following example assigns the command to toggle the Register window command (WR) to the F2 function-key. The caret “^” makes the function invisible, and the semicolon “;” ends the function with a carriage return. After you enter this command, you can press the F2 key to toggle the Register window on or off.

```
FKEY f2 ^wr;
```

The following example shows that multiple commands can be assigned to a single function and that partial commands can be assigned for the user to complete. After you enter this command, pressing the Ctrl F1 key sequence causes the program to execute until location CS:8028F000h is reached, displays the stack contents, and starts the U command for the user to complete.

```
FKEY cf1 g cs:8028f000;d ss:esp;u cs:eip+
```

After you enter the following example, pressing the F1 key makes the Data window three lines long and dumps data starting at 100h in the segment currently displayed in the Data window.

```
FKEY f1 wd 3;d 100;
```

The following example assigns commands to the F1 key to toggle the Register window, create a Locals window of length 8, and a Code window of length 10.

```
FKEY f1 wr;wl 8;wc 10;
```

FLASH

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Definition

Restore the Windows screen during P and T commands.

Syntax

FLASH [**on** | **off**]

Use

Use the FLASH command to specify whether the Windows screen restores during any T (trace) and P (step over) commands. If you specify that the Windows screen is to be restored, it is restored for the brief time period that the P or T command is executing. This feature is needed to debug sections of code that access video memory directly.

In most cases, if the routine being called writes to the Windows screen, and the P command executes across such a call, the screen restores. However, when you are debugging protected mode applications, such as VxDs or Windows applications, with FLASH off, SoftICE restores the screen only if the display driver is called before the call is completed.

If you do not specify a parameter, the current state of FLASH displays.

The default is FLASH OFF.

Example

The following command turns on FLASH mode. The Windows screen restores during any subsequent P or T commands.

```
FLASH on
```

See Also

SET

FMUTEX

OS

Windows NT family

Type

System Information

Definition

Display information about a mutant kernel object.

Syntax

FMUTEX [**expression**]

expression An expression that resolves to a valid address is acceptable.

Use

The FMUTEX command displays information about the mutant object identified by the expression you specify.

You must enter an expression to get data, because this is not itself a Windows NT- type object. The *expression* parameter is something that would not generally be considered a name. That is, it is a number, a complex expression (an expression which contains operators, such as Explorer + 0), or a register name.

Example

The following example displays information about the FMUTEX object:

```
FMUTEX ecx
Address   Count     Own KTEB(TID)   Contention   OLDIql
State
8014EA10  1                1( 0P)   0            0
Clear
```

See Also

KMUTEX

FOBJ

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display information about a file object.

Syntax

FOBJ [***fobj-address***]

fobj-address	Address of the start of the file object structure to be displayed.

Use

The FOBJ command displays the contents of kernel file objects. The command checks for the validity of the specified file object by insuring that the device object referenced by it is a legitimate device object.

The fields shown by SoftICE are not documented in their entirety here, as adequate information about them can be found in NTDDK.H in the Windows NT/2000/XP DDK. A few fields deserve special mention, however, because device driver writers find them particularly useful:

DeviceObject	This field is a pointer to the device object associated with the file object.
Vpb	This is a pointer to the volume parameter block associated with the file object (if any).
FSContext1 and FSContext2	These are file system driver (FSD) private fields that can serve as keys to aid the driver in determining what internal FSD data is associated with the object.

Other fields of interest, whose purpose should be fairly obvious, include the access protection booleans, the Flags, the FileName and the CurrentByteOffset.

Example

The following example shows output from the FOBJ command.

```
FOBJ fd877230

DeviceObject *     : FD881570
Vpb *              : 00000000
FsContext *        : FD877188
FsContext2 *       : FD877C48
SecObjPointer *    : FD8771B4
PrivateCacheMap *  : 00000001
FinalStatus        : 00000000
RelatedFileObj *   : 00000000
LockOperation      : False
DeletePending      : False
ReadAccess         : True
WriteAccess        : True
DeleteAccess       : False
SharedRead         : True
SharedWrite        : True
SharedDelete       : False
Flags              : 00040002 FO_SYNCHRONOUS_IO |
FO_HANDLE_CREATED
FileName           : \G:\SS\data\status.dat
CurrentByteOffset  : 00
Waiters            : 00000000
Busy               : 00000000
LastLock*          : 00000000
&Lock              : FD877294
&Event             : FD8772A4
ComplContext*            : 00000000
```

FORMAT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Shift-F3

Definition

Change the format of the Data window.

Syntax

FORMAT

Use

Use the FORMAT command to change the display format in the currently displayed Data window. FORMAT cycles through the display formats in the following order: byte, word, dword, short real, long real, 10-byte real, and then byte again. Each call to FORMAT changes the window to the next display format in this order. This command is most useful when assigned to a function key. The default function key assignment is Shift-F3. Shift-F3 is also supported while editing in the Data window.

Example

The following example changes the Data window to the next display format in the sequence byte, word, dword, short real, long real, and 10-byte real.

```
FORMAT
```

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Definition

Go to an address.

Syntax

G [=*start-address*] [*break-address*]

=start-address	Any expression that resolves to a valid address is acceptable.
break-address	Any expression that resolves to a valid address is acceptable.

Use

The G command exits from SoftICE. If you specify break-address, a single one-time execution breakpoint is set on that address. In addition, all sticky breakpoints are armed.

Execution begins at the current CS:EIP unless you supply the start-address parameter. If you supply the start-address parameter, execution begins at start-address. Execution continues until the break-address is encountered, the SoftICE pop-up key sequence is used, or a sticky breakpoint is triggered. When SoftICE pops up, for any reason, the one-time execution breakpoint is cleared.

The break-address must be the first byte of an instruction opcode.

The G command without parameters behaves the same as the X command.

If the Register window is visible when SoftICE pops up, all registers that have been altered since the G command was issued are displayed with the bold video attribute.

For Windows 3.1

The non-sticky execution breakpoint uses an INT 3 instruction breakpoint.

For Windows 9x and the Windows NT family

The non-sticky execution breakpoint uses debug registers unless none are available. If none are available, it uses an INT 3 instruction.

Example

The following command sets a one-time breakpoint at address CS:80123456h.

```
G 80123456
```

GDT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Global Descriptor Table.

Syntax

GDT [***selector***]

selector	Starting GDT selector to display

Use

The GDT command displays the contents of the Global Descriptor Table. If you specify an optional selector, only information on that selector is listed. If the specified selector is a local descriptor table (LDT) selector (that is, bit 2 is a 1), SoftICE automatically displays information from the LDT, rather than the GDT.

Output

The base linear address and the limit of the GDT is shown at the top of the GDT command's output. Each subsequent line of the output contains the following information:

selector value	The lower two bits of this value reflects the descriptor privilege level.
selector type	One of the following:

Type	Description
Code16	16-bit code selector
Data16	16-bit data selector
Code32	32-bit code selector
Data32	32-bit data selector
LDT	Local Descriptor Table selector

Type	Description
TSS32	32-bit Task State Segment selector
TSS16	16-bit Task State Segment selector
CallG32	32-bit Call Gate selector
CallG16	16-bit Call Gate selector
TaskG32	32-bit Task Gate selector
TaskG16	16-bit Task Gate selector
TrapG32	32-bit Trap Gate selector
TrapG16	16-bit Trap Gate selector
IntG32	32-bit Interrupt Gate selector
IntG16	16-bit Interrupt Gate selector
Reserved	Reserved selector

selector base — Linear base address of the selector.

selector limit — Size of the selector's segment.

selector DPL — The selector's descriptor privilege level (DPL), which is either 0, 1, 2 or 3.

present bit — P or NP, indicating whether the selector is present or not present.

segment attributes — One of the following:

Value	Description
RW	Data selector is readable and writable.
RO	Data selector is read only.
RE	Code selector is readable and executable.
EO	Code selector is execute only.
B	TSS's busy bit is set.
ED	Expand down data selector.

Example

The following command shows abbreviated output from the GDT command.

```
GDT
Sel.  Type      Base      Limit     DPL  Attributes
GDTbase=C1398000  Limit=0FFF
0008  Code16    00017370  0000FFFF  0    P   RE
0010  Data16    00017370  0000FFFF  0    P   RW
0018  TSS32     C000AEBC  00002069  0    P   B
0020  Data16    C1398000  00000FFF  0    P   RW
0028  Code32    00000000  FFFFFFFF  0    P   RE
0030  Data32    00000000  FFFFFFFF  0    P   RW
003B  Code16    C33E9800  000007FF  3    P   RE
0043  Data16    00000400  000002FF  3    P   RW
0048  Code16    00013B10  0000FFFF  0    P   RE
0050  Data16    00013B10  0000FFFF  0    P   RW
0058  Reserved  00000000  0000FFFF  0    NP
0060  Reserved  00000000  0000FFFF     0           NP
```

GENINT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Definition

Force an interrupt to occur.

Syntax

GENINT [**nmi** | **int1** | **int3** | ***interrupt-number***]

nmi	Forces a non-maskable interrupt.
int1	Forces an INT1 interrupt.
int3	Forces an INT3 interrupt.
interrupt-number	For Windows 3.1 and Windows 9x: Valid interrupt number between 0 and 5Fh. For the Windows NT family: Valid interrupt number between 0 and FFh.

Use

The GENINT command forces an interrupt to occur. Use this function to hand off control to another debugger you are using with SoftICE, and to test interrupt routines.

The GENINT command simulates the processing sequence of a hardware interrupt or an INT instruction. It vectors control through the current IDT entry for the specified interrupt number.

Caution: You must make certain that there is a valid interrupt handler before using this command. SoftICE does not know if there is a handler installed. Your machine is likely to crash if you issue this command without a handler.

GENINT cannot be used to simulate a processor fault that pushes an exception code. For example, GENINT cannot simulate a general protection fault.

Example

The following command forces a non-maskable interrupt. It gives control back to CodeView for DOS, if you use SoftICE as an assistant to CodeView for DOS.

```
GENINT nmi
```

If using CodeView for Windows, use the command:

```
GENINT 0
```

To pass control to other debuggers, experiment with interrupt-numbers 0, 1, 2 and 3.

When the command I3HERE==ON, and you are using a level -3 debugger, such as BoundsChecker, SoftICE traps on any INT 3 breakpoints installed by the level-3 debugger. The following example shows how to avoid this situation. Set I3HERE==OFF, and use the GENINT command to reactivate the breakpoint. This returns control to the level -3 debugger, and SoftICE does not trap subsequent INT 3s.

```
I3HERE off
GENINT 3
```

H

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Key

F1

Definition

Display help information.

Syntax

For Windows 3.1

H [***command*** | ***expression***]

For Windows 9x and the Windows NT family

H [***command***]

Use

For Windows 3.1

Under Windows 3.1, the parameter you supply determines whether help is displayed or an expression is evaluated. If you specify a command, help displays detailed information about the command, including the command syntax and an example. If you specify an expression, the expression is evaluated, and the result is displayed in hexadecimal, decimal, signed decimal (only if < 0), and ASCII.

For Windows 9x and the Windows NT family

Under Windows 9x and the Windows NT family, the H command displays help on SoftICE commands. (Refer to ? on page 3 for information about evaluating expressions under Windows 9x and the Windows NT family.) To display general help on all the SoftICE commands, enter the H command with no parameters. To see detailed information about a specific command, use the H command followed by the name of the command on which you want help. Help displays a description of the command, the command syntax, and an example.

Example

The following example displays information about the ALTKEY command:

```
H altkey

Set key sequence to invoke window
ALTKEY [ALT letter | CTRL letter]
ex: ALTKEY ALT D
```

See Also

?

HBOOT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Definition

Do a hard system boot (total reset).

Syntax

HBOOT

Use

The HBOOT command resets the computer system. SoftICE is not retained in the reset process. HBOOT is sufficient unless an adapter card requires a power-on reset. In those rare cases, the machine power must be recycled.

HBOOT performs the same level of system reset as pressing Ctrl-Alt-Delete when not in SoftICE.

Example

The following command forces the system to reboot.

```
HBOOT
```

HEAP

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Windows global heap.

Syntax

HEAP -L [free | *module-name* | *selector*]

-L	Display only global heap entries that contain a local heap.
free	Display only heap entries marked as FREE.
module-name	Name of the module.
selector	LDT selector.

Use

For Windows 9x

For 16-bit modules, the HEAP command works the same as it does under Windows 3.1.

For the Windows NT family

For 16-bit modules, the HEAP command works the same as it does under Windows 3.1, but is process-specific. You must be in a NTVDM process that contains a WOW (Windows on Windows) box.

Tip: *For Windows 9x, refer to HEAP32 on page 143.*

For the Windows NT family, refer to HEAP32 on page 146.

For Windows 3.1

The HEAP command displays the Windows global heap in the Command window.

- If you do not specify parameters, the entire global heap displays.
- If you specify FREE, only heap entries marked as FREE display.
- If you specify the module name, only heap entries belonging to the module display.

- If you specify an LDT selector, only a single heap entry corresponding to the selector displays.

At the end of the listing, the total amount of memory used by the heap entries that displayed is shown. If the current CS:EIP belongs to one of the heap entries, that entry displays with the bold video attribute.

If there is no current LDT, the HEAP command is unable to display heap information.

Output

For each heap entry the following information displays:

selector or handle — In Windows 3.1, this is almost the same thing. Heap selectors all have a dpl of 3 while the corresponding handle is the same selector with a dpl of 2. For example, if the handle was 106h, the selector would be 107h. Use either of these in an expression.

address — 32-bit flat virtual address.

size — Size of the heap entry in bytes.

module name — Module name of the owner of the heap entry.

type — Type of entry. One of the following:

Type	Description
Code	Non-discardable code segment
Code D	Discardable code segment
Data	Data segment
ModuleDB	Module data base segment
TaskDB	Task data base segment
BurgerM	Burger Master (The heap itself)
Alloc	Allocated memory
Resource	Windows Resource

Additional Type Information

If the heap entry is a code or a data segment, the segment number from the .EXE file displays. If the heap entry is a resource, one of the following resource types may display:

UserDef	Icon	String	Accel	IconGrp
Cursor	Menu	FontGrp	ErrTable	NameTabl
Bitmap	Dialog	Font	CursGrp	

Example

The following example displays all heap entries belonging to the KERNEL module.

```
HEAP kernel

Han/Sel   Address       Length     Owner    Type        Seg/Rsr
00F5      000311C0      000004C0   KERNEL   ModuleDB
00FD      00031680      00007600   KERNEL   Code        01
0575      00054220      00003640   KERNEL   Alloc
0106      00083E40      00002660   KERNEL   Code D      02
010E      805089A0      00001300   KERNEL   Code D      03
0096      80520440      00000C20   KERNEL   Alloc
Total Memory:62K
```

See Also

For Windows 9x, refer to *HEAP32* on page 143.
For the Windows NT family, refer to *HEAP32* on page 146.

HEAP32

OS

Windows 9x

Type

System Information

Definition

Display the Windows global heap.

Syntax

HEAP32 [***hheap32*** | ***task-name***]

hheap32	Heap handle returned from HeapCreate( ).
task-name	Name of any 32-bit task.

Use

For Windows 9x

The HEAP32 command displays heaps for a process.

Note: For 16-bit modules, use the *HEAP32* on page 146.

The HEAP32 command displays the following:

- KERNEL32 default system heap.
- Private heaps of processes created through the HeapCreate( ) function.
- Two Ring-0 heaps created by VMM. The first one displayed is the pagelocked heap, and the second is the pagetable heap.
- One Ring-0 heap for every existing virtual machine.

Tip: *For Windows 3.1, Windows 9x, and the Windows NT family, refer to HEAP on page 140.*

For the Windows NT family, refer to HEAP32 on page 146.

If you provide a process name, SoftICE displays the entire default process heap for that process, and the address context automatically changes to that of the process. To view a nondefault heap for a process, specify the heap base address instead of the process name.

The debug versions of Windows 9x provide extra debugging information for each heap element within a heap. To see this information, you must be running the appropriate debug version, as follows:

- For KERNEL32 Ring-3 heaps, have the SDK debug version installed.

- For VMM Ring-0 heaps, have the DDK debug version of VMM installed.

Output

For each heap entry, the following information displays:

HeapBase	Address at which the heap begins.
MaxSize	Current maximum size to which the heap can grow without creating a new segment.
Committed	Number of kilobytes of committed memory that are currently present in physical memory.
Segments	Number of segments in the heap. Each time the heap grows past the current maximum size, a new heap segment is created.
Type	

Heap Type	Description
Private	Ring 3 heap created by an application process.
System	Ring 3 default heap for KERNEL32.
Ring0	Ring 0 heap created by VMM.
VM##	Heap created by VMM for a specific Virtual Machine to hold data structures specific to that VM.

Owner	Name of the process that owns the heap.

When displaying an individual 32-bit heap, the following information displays:

Heap Type	Description
Address	Address of the heap element
Size	Size in bytes of the heap element
Free	If the heap element is a free block, the word FREE appears; otherwise, the field is blank.

When the appropriate debug versions of the SDK and DDK are installed, the following extra information appears for each heap element:

Heap Element	Description
EIP	EIP address of the code that allocated the heap element.
TID	VMM thread-id of the allocating thread
Owner	Nearest symbol to the EIP address

Example

The following example displays all 32-bit heaps.

```
HEAP32

HeapBase   Max Size  Committed  Segments  Type      Owner
00EA0000   1024K     8K         1         Private   Mapisp32
00DA0000   1024K     8K         1         Private   Mapisp32
00CA0000   1024K     8K         1         Private   Mapisp32
00960000   1024K     8K         1         Private   Mapisp32
00860000   1024K     8K         1         Private   Mapisp32
```

The following example displays all heap entries for Exchng32.

```
HEAP32 exchng32

Heap: 00400000  Max Size: 1028K Committed: 12K  Segments: 1
Address         Size
00400078        000004E4
00400560        00000098
004005FC        00000054
00400654        000000A4
004006FC        00000010
00400710        00000014        Free
```

See Also

For general information on the HEAP command, refer to *HEAP* on page 140. For Windows NT family information on this command, refer to *HEAP32* on page 146.

HEAP32

OS

Windows NT family

Type

System Information

Definition

Display the Windows heap.

Syntax

HEAP32 [[**-w -x -s -v -b -trace**] [***heap*** | ***heap-entry*** | ***process-type***]]

-w	Walk the heap, showing information about each heap entry.
-x	Show an extended summary of a 32-bit heap.
-s	Provide a segment summary for a heap.
-v	Validate a heap or heap-entry.
-b	Show base address and sizes of heap entry headers.
-trace	Display a heap trace buffer.
heap	32-bit heap handle.
heap-entry	Heap allocated block returned by HeapAlloc or HeapRealloc.
process-type	Process name, process-id, or process handle (KPEB).

Use

All HEAP32 options and parameters are optional. If you do not specify options or parameters, a basic heap summary displays for every heap in every process. If a parameter is specified without options, a summary will be performed for the heap-entry, heap, or in the case of a process-type, a summary for each heap within the process.

Note: All 16-bit HEAP functionality still works. Refer to *HEAP* on page 140 for Windows 3.1. This information only applies to HEAP32.

Tip: For general information on the HEAP command, refer to HEAP on page 140.

For Windows 9x information, refer to HEAP32 on page 143.

The Walk Option

The walk option (-w) walks a heap, showing the state of each heap-entry on a heap. Walk is the default option if you specify a heap handle without other options.

The Extended Option

The extended option (-x) displays a detailed description of all useful information about a heap, including a segment summary and a list of any Virtually Allocated Blocks (VABs) or extra UnCommitted Range (UCR) tables that may have been created for the heap.

The Segment Option

The segment option (-s) displays a simple summary for the heap and for each of its heap-segments. Segments are created to map the linear address space for a region of a heap. A heap can be composed of up to sixteen segments.

The Validate Option

The validate option (-v) completely validates a single heap-entry, or a heap and all of its components, including segments, heap-entries, and VABs. In most cases, the heap validation is equivalent to or stricter than the Win32 API Heap functions. The validate option is the only option that takes a heap-entry parameter as input. All other options work with heap handles or process-types. If the heap is valid, an appropriate message displays. If the validation fails, one of the following error messages appears.

- For a block whose header is corrupt, SoftICE displays the following message:

  ```
  Generic Error: 00140BD0 is not a heap entry, or it is
  corrupt
  ```

  ```
  Specific Error: 00140BD0: Backward link for Block is invalid
  ```

- For a block whose guard-bytes have been overwritten, SoftICE displays the following message:

  ```
  Allocated block: 00140BD0: Block BUSY TAIL is corrupt
  ```

Note: If you run your application under a debugger, for example, BoundsChecker or Visual C++, each allocated block has guard-bytes, and each free block is marked with a pattern so that random overwrites can be detected.

- For a free block that has been written to, subsequent to being freed, SoftICE displays the following message:

  ```
  Free block: 00140E50: Free block failed FREE CHECK at 141E70
  ```

The Base Option

Use the base option (-b) to change the mode in which addresses and heap entry sizes display. Under normal operation, all output shows the address of the heap-entry data, and the size of the user data for that block. When you specify the base option, all output shows the address of the heap-entry header, which precedes each heap-entry, and the size of the full heap-entry. The size of the full heap-entry includes the heap-entry header, and any extra data allocated for guard-bytes or to satisfy alignment requirements. Under most circumstances you only specify base addressing when you need to walk a heap or its entries manually.

When you use the base option, the base address for each heap-entry is 8 bytes less than when base is not specified, because the heap-entry header precedes the actual heap-entry by 8 bytes. Secondly, the size for the allocated blocks is larger because it includes an additional 8 bytes for the heap-entry header, guard-bytes, and any extra bytes needed for proper alignment. The output from the base option is useful for manually navigating between adjacent heap entries, and for checking for memory overruns between the end of the heap-entry data and any unused space prior to the guard-bytes. The guard-bytes are always allocated as the last two DWORDs of the heap entry.

Note: The base option has no effect on input parameters. Heap-entry addresses are always assumed to be the address of the heap-entry data.

The Trace Option

Use the trace option (-trace) to display the contexts of a heap trace buffer which record actions that occur within a heap. Heap trace buffers are optional and are generally not created. To enable tracing in the Win32 API, specify the HEAP_CREATE_ENABLE_TRACING flag as one of the flags to ntdll!RtlCreateHeap. You cannot use this option with Kernel32!HeapCreate( ) because it strips out all debug-flags before calling ntdll!RtlCreateHeap. You must also run the application under a level-3 debugger, for example, BoundsChecker or the Visual C++ debugger, so that the Win32 heap debugging options will be enabled.

Any time you pass a process-type as a parameter, any and all options are performed for each heap within the process.

The HEAP32 command and all of its options work on either a single specified heap handle or ALL the heaps for an entire process.

The following command performs a heap validation for all the heaps in the Test32 process:

```
HEAP 32 -v test32
```

When you specify a bare (for example, 0x140000), SoftICE assumes it is in the current context. You can use the ADDR command to change to the appropriate context, if necessary.

In some cases, the actual physical memory that backs a particular linear address will not be present in memory, because it has been paged out by the operating system. In these cases, the HEAP32 command detects, avoids, and, where possible, continues to operate without the "not-present" pages. If not-present memory prevents the HEAP32 command from performing its work, you are notified of that condition. When possible the HEAP32 command skips not-present pages and continues processing at a point where physical memory is present. Since not-present memory prevents the HEAP32 command from performing a full validation of a heap, the validation routines indicate success, but let you know that only a *partial* validation could be performed.

Output

Base	Base address of the heap, that is, the heap handle.
Id	Heap ID.
Cmmt/Psnt/Rsvd	Amount of committed, present, and reserved memory used for heap entries.
Segments	Number of heap segments within the heap.
Flags	Heap flags, for example, HEAP_GROWABLE (0x02).
Process	Process that owns the heap.

If you specify the -W switch, the following information displays:

Base	This is the address of the heap entry.
Type	Type of the heap entry.

Heap Entry	Description
HEAP	Represents the heap header.
SEGMENT	Represents a heap segment.
ALLOC	Active heap entry.
FREE	Inactive heap entry.
VABLOCK	Virtually-allocated block (VAB).

Size	Size of the heap-entry. Typically, this is the number of bytes available to the application for data storage.
Seg#	Heap segment in which the heap-entry is allocated.

Flags	Heap entry flags.

If you specify the -S switch, the following *additional* information displays:

Seg#	Segment number of the heap segment.
Segment Range	Linear address range that this segment maps to.
Cmmt/Psnt/Rsvd	Amount of committed, present, and reserved memory for this heap segment.
Max UCR	Maximum uncommitted range of linear memory. This value specifies the largest block that can be created within this heap segment.

Example

The following example displays a basic heap summary for every heap in every process.

```
HEAP32

Base        Id    Cmmt/Psnt/Rsvd    Segments  Flags      Process
00230000    01    0013/0013/00ED           1  00000002   csrss
7F6F0000    02    0008/0008/00F8           1  00007008   csrss
00400000    03    001C/001A/0024           1  00004003   csrss
7F5D0000    04    0005/0005/001B           1  00006009   csrss
00460000    05    00F6/00F1/001A           2  00003002   csrss
005F0000    06    000B/000B/0005           1  00005002   csrss
7F2D0000    07    002D/002D/02D3           1  00006009   csrss
02080000    08    0003/0003/0001           1  00001062   csrss
023C0000    09    0016/0014/00EA           1  00001001   csrss
```

See Also

For general information on the HEAP command, refer to *HEAP* on page 140. For Windows 9x information on this command, refer to *HEAP32* on page 143.

HERE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Key

F7

Definition

Go to the current cursor line.

Syntax

HERE

Use

When the cursor is in the Code window, the HERE command executes until the program reaches the current cursor line. HERE is only available when the cursor is in the Code window. If the Code window is not visible or the cursor is not in the Code window, use the G command instead. Use the EC command (default key F6), if you want to move the cursor into the Code window.

To use the HERE command, place the cursor on the source statement or assembly instruction to which you want to execute. Enter HERE or press the function key that HERE is programmed to (default key F7).

The HERE command sets a single, one-time execution breakpoint set at the address of the current cursor position, arms all sticky breakpoints, and exits from SoftICE.

Execution begins at the current CS:EIP and continues until the execution breakpoint is encountered, the window pop-up key sequence is used, or a sticky breakpoint occurs. When SoftICE pops up, for any of these reasons, the one-time execution breakpoint is cleared.

If the Register window is visible when SoftICE pops up, all registers that have been altered since the HERE command was issued display with the bold video attribute.

For Windows 3.1

The non-sticky execution breakpoint uses an INT 3 instruction breakpoint.

For Windows 9x and the Windows NT family

The non-sticky execution breakpoint uses debug registers unless none are available, in which case, it uses an INT 3 instruction.

Example

The following command sets an execution breakpoint at the current cursor position, exits from SoftICE, and begins execution at the current CS:EIP.

```
HERE
```

HS

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Search the history buffer for the specified string.

Syntax

HS [- | +] string

- *(minus sign)*	Search backwards from this point.
+ *(plus sign)*	Search forwards from this point.
string	Specified search string.

Use

You can search forward (which is the default) using the '+', or backward, using '-'. If you enter this command without parameters, SoftICE uses the previous search, starting from the last string found.

Use single quotation marks to search for text that includes spaces.

Example

Enter the following command to find the first load notifications for the net module in the history buffer.

```
HS 'load32 mod=net'
```

See Also

S, SS

HWND

OS

Windows 3.1, Windows 9x

Type

System Information

Definition

Display information on Window handles.

Syntax

For Windows 3.1

HWND [***level***] [***task-name***]

For Windows 9x

HWND [**-x**][**hwnd** | [[***level***][***process-name***]]

Tip: For the Windows NT family, refer to the HWND on page 157.

level	Windows hierarchy number. 0 is the top level, 1 is the next level and so on. The window levels represent a parent child relationship. For example, a level 1 window has a level 0 parent.
task-name	Any currently loaded Windows task. These names are available with the TASK command.
-x	Display extended information about a window.
hwnd	Windows handle.
process-name	Name of any currently loaded process.

Use

Specifying a window handle as a parameter displays only the information for that window handle. If you specify a window handle, you do not need to specify the optional parameters for level and process-name.

Output

For each window handle, the following information is displayed:

Class Name	Class name or atom of class that this window belongs to.

Window Procedure	Address of the window procedure for this window.

Example

The following example displays the output of the HWND command from the MSWORD process with no other parameters set.

```
HWND msword

Handle      hQueue      QOwner   Class       Procedure
0F4C(0)     087D        MSWORD   #32769      DESKTOP
   0FD4(1)  080D        MSWORD   #32768      MENUWND
   22C4(1)  087D        MSWORD   OpusApp     0925:0378
   53E0(2)  087D        MSWORD   OpusPmt     0945:1514
   2764(2)  087D        MSWORD   a_sdm_Msft  0F85:0010
   2800(3)  087D        MSWORD   OpusFedt    0F85:0020
   2844(3)  087D        MSWORD   OpusFedt    0F85:0020
   2428(2)  087D        MSWORD   OpusIconBar 0945:14FE
   2888(2)  087D        MSWORD   OpusFedt    0945:14D2
```

The following example displays part of the output follows of the HWND command for the WINWORD process with the -x option set. The -x option displays extended information about a window.

```
HWND -x winword

Window Handle         : (0288) Level (1)
    Parent            : 16A7:000204CC
    Child             : NULL
    Next              : 16A7:00020584
    Owner             : NULL
    Window RECT       : (9,113) - (210,259)
    Client RECT       : (10,114) - (189,258)
    hQueue            : 1C97
      Size            : 16
      QOwner          : WINWORD
    hrgnUpdate        : NULL
    wndClass          : 16A7:281C
    Class             : ListBox
```

```
HWND -x winword

Window Handle          : (0288) Level (1)
    hInstance          : (349E) (16 bit hInstance)
    lpfnWndProc        : 2417:000057F8
    dwFlags1           : 40002
    dwStyle            : 44A08053
    dwExStyle          : 88
    dwFlags2           : 0
    ctrlID/hMenu       : 03E8
    WndText            : NULL
    unknown1           : 4734
    propertyList       : NULL
    lastActive         : NULL
    hSystemMenu        : NULL
    unknown2           : 0
    unknown3           : 0000
    classAtom          : C036
    unknown4           : 4CAC
    unknown5           : A0000064
```

See Also

For the Windows NT family, refer to *HWND* on page 157.

HWND

OS

Windows NT family

Type

System Information

Definition

Display information on Window handles.

Syntax

HWND [**-x**][**-c**] [***hwnd-type*** | ***desktop-type*** | ***process-type*** | ***thread-type*** | ***module-type*** | ***class-name***]

-x	Extended. Display extended information about each window handle.
-c	Children. Force the display of the window hierarchy when searching by thread-type, module-type, or class-name.
hwnd-type	Window handle or pointer to a window structure.
desktop-type	Desktop handle or desktop pointer to a window structure (3.51 only).
process-type, thread-type or module-type	Window owner-type. A value that SoftICE can interpret as being of a specific type such as process name, thread ID, or module image base.
class name	Name of a registered window class.

Use

The HWND command enumerates and displays information about window handles.

The HWND command allows you to isolate windows that are owned by a particular process, thread or module, when you specify a parameter of the appropriate type.

Tip: *For Windows 3.1 and Windows 9x, refer to HWND on page 154.*

The extended option (-x) shows extended information about each window.

When you specify the extended option, or an owner-type (process-type, thread-type, or module-type) as a parameter, the HWND command will not automatically enumerate child windows. Specifying the children option (-c) forces all child windows to be enumerated regardless of whether they meet any specified search criteria.

Output

For each HWND that is enumerated, the following information is displayed:

Handle	HWND handle (refer to *OBJTAB* on page 230 for more information). Each window handle is indented to show its child and sibling relationships to other windows.
Class	Registered class name for the window, if available (refer to *CLASS* on page 64 for more information).
WinProc	Address of the message callback procedure. Depending on the callback type, this value is displayed as a 32-bit flat address or 16-bit selector:offset.
TID	Owning thread ID.
Module	Owning module name (if available). If the module name is unknown, the module handle will be displayed as a 32-bit flat address or 16-bit selector:offset, depending on the module type.

Example

The following example uses the HWND command without parameters or options.

```
HWND
Handle    ClassWinProcTID  Module
01001E    #32769 (Desktop)5FBFE42524winsrv
 050060    #32770 (Dialog)60A2930418winlogon
 010044    SAS window class022A49C418winlogon
 010020    #32768 (PopupMenu)5FBEDBD524winsrv
010022    #32769 (Desktop)5FBFE42524winsrv
 010024    #32768 (PopupMenu)5FBEDBD524winsrv
 030074    Shell_TrayWnd0101775E67Explorer
  030072    Button01012A4E67Explorer
  0800AA    TrayNotifyWnd010216C467Explorer
   03003E    TrayClockWClass01028C8567Explorer
  030078    MSTaskSwWClass01022F6967Explorer
   030076    SysTabControl32712188A867Explorer
 05007A    tooltips_class327120B43A67Explorer
 03003C    tooltips_class327120B43A67Explorer
 2E00F0    NDDEAgnt016E18F14Bnddeagnt
1C0148    CLIPBOARDWNDCLASS034F:29182COLE2
 9B0152    DdeCommonWindowClass77C2D88B2Cole32
 3200F2    OleObjectRpcWindow77C2D73B2Cole32
 0800A2    DdeCommonWindowClass77C2D88B67ole32
 030086    OleMainThreadWndClass77C2DCF267ole32
 030088    OleObjectRpcWindow77C2D73B67ole32
 03008A    ProxyTarget71E6869A67shell32
 03008C    ProxyTarget71E6869A67shell32
 030070    ProxyTarget71E6869A67shell32
 04007C    ProxyTarget71E6869A67shell32
 0400CC    OTClass0100D7F367Explorer
 0300CA    DDEMLEvent5FC216AB67winsrv
 0300C6    DDEMLMom60A2779D6700000000
 0300C0    #420BB7:077678MMSYSTEM
 0300D2    WOWFaxClass01F9F7A878WOWEXEC
 060062    ConsoleWindowClass5FCD23C72Bwinsrv
 0300B4    WOWExecClass03CF:0B3E78WOWEXEC
 030068    Progman0101B1D367Explorer
  0E00BC    SHELLDLL_DefView71E300E867shell32
   040082    SysListView327121A0EC67shell32
    030080    SysHeader327120B06F67shell32
```

Notes: The output from the previous example enumerates two desktop windows (handles 1001E and 10022), each with its own separate window hierarchy. This is because the system can create more than one object of type Desktop, and each Desktop object has its own Desktop Window which defines the window hierarchy. If you use the

HWND command in a context that does not have an assigned Desktop, the HWND command enumerates all objects of type Desktop.

Since the system may create more than one object of type Desktop, the HWND command accepts a Desktop-type handle as a parameter. This allows the window hierarchy for a specific Desktop to be enumerated. You can use the command OBJTAB DESK to enumerate all existing desktops in the system.

The following is an example of using the HWND command with a specific window handle.

```
HWND 400a0

Handle    ClassWinProcTIDModule
0400A0    Progman0101B1D374Explorer
```

The following is an example of enumerating only those windows owned by thread 74.

```
HWND 74

Handle    ClassWinProcTIDModule
 2F00F0    Shell_TrayWnd0101775E74Explorer
  0500CE    Button01012A4E74Explorer
  0500C4    TrayNotifyWnd010216C474Explorer
   040074    TrayClockWClass01028C8574Explorer
  0500C6    MSTaskSwWClass01022F6974Explorer
   0400C8    SysTabControl32712188A874Explorer
 3700F2    tooltips_class327120B43A74Explorer
 040066    tooltips_class327120B43A74Explorer
 0F00BC    DdeCommonWindowClass77C2D88B74ole32
 040068    OleMainThreadWndClass77C2DCF274ole32
 0500CC    OleObjectRpcWindow77C2D73B74ole32
 2600BA    ProxyTarget71E6869A74shell32
 0400D0    ProxyTarget71E6869A74shell32
 0400CA    ProxyTarget71E6869A74shell32
 070094    ProxyTarget71E6869A74shell32
 04009E    OTClass0100D7F374Explorer
 480092    DDEMLEvent5FC216AB74winsrv
 09004A    DDEMLMom60A2779D7400000000
 0400A0    Progman0101B1D374Explorer
  0500C0    SHELLDLL_DefView71E300E874shell32
   070090    SysListView327121A0EC74shell32
    050096    SysHeader327120B06F74shell32
```

Note: A process-name always overrides a module of the same name. To search by module, when there is a name conflict, use the module handle (base address or module-database selector) instead. Also, module names are always context sensitive. If the module is not loaded in the current context (or the CSRSS context), the HWND command interprets the module name as a class name instead.

The following example shows the output when the extended option (-x) is used.

```
HWND -x 400a0

Hwnd           : 0400A0    (7F2D7148)
Class Name     : Progman
Module         : Explorer
Window Proc    : 0101B1D3
Win Version    : 4.00
Title          : Program Manager
Desktop        : 02001F    (00402D58)
Parent         : 010022    (7F2D0C28)
1st Child      : 0500C0    (7F2D7600)
Style          : CLIPCHILDREN | CLIPSIBLINGS | VISIBLE | POPUP
Ex. Style      : TOOLWINDOW | A0000000
Window Rect    : 0, 0, 1024, 768 (1024 x 768)
Client Rect    : 0, 0, 1024, 768 (1024 x 768)
```

See Also

For Windows 3.1 and Windows 9x, refer to *HWND* on page 154.

I

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

I/O Port

Definition

Input a value from an I/O port.

Syntax

I[***size***] ***port***

size

Value	Description
B	Byte
W	Word
D	DWORD

port Port address.

Use

You use the I command to read and display a value from a specified hardware port. Input can be done from byte, word, or dword ports. If you do not specify size, the default is byte.

Except for the interrupt mask registers, the I command does an actual I/O instruction, so it is displays the actual state of the hardware port. However, in the case of virtualized ports, the actual data returned by the I command may not be the same as the virtualized data that an application would see.

The only ports that SoftICE does not do I/O on are the interrupt mask registers (Port 21 and A1). For those ports, SoftICE shows the value that existed when SoftICE popped up.

Example

The following example performs an input from port 21, which is the mask register for interrupt controller one.

```
I 21
```

I1HERE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Mode Control

Definition

Pop up on embedded INT 1 instructions.

Syntax

I1HERE [**on** | **off**]

Use

Use the I1HERE command to specify that any embedded interrupt 1 instruction brings up the SoftICE screen. This feature is useful for stopping your program in a specific location. When I1HERE is on, SoftICE checks to see whether an interrupt is really an INT 1 in the code before popping up. If it is not an INT 1, SoftICE will not pop up.

To use this feature, place an INT 1 into the code immediately before the location where you want to stop. When the INT 1 occurs, it brings up the SoftICE screen. At this point, the current EIP is the instruction after the INT 1 instruction.

If you do not specify a parameter, the current state of I1HERE displays.

The default is I1HERE off.

This command is useful when you are using an application debugging tool such as BoundsChecker. Since these tools rely on INT 3's for breakpoint notifications, I1HERE allows you to use INT 1s as hardwired interrupts in your code without triggering the application debugger.

For Windows 3.1 and Windows 9x

VMM, the Windows memory management VxD, executes INT 1 instructions prior to certain fatal exits. If you have I1HERE ON, you can trap these. The INT 1s generated by VMM are most often caused by a page fault with the registers set up as follows:

- EAX=faulting address
- ESI points to an ASCII message

- EBP points to a CRS (Client Register Structure as defined in the DDK include file VMM.INC).

Example

The following example turns on I1HERE mode. Any INT 1s generated after this point bring up the SoftICE screen.

```
I1HERE on
```

I3HERE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Mode Control

Definition

Pop up on INT 3 instructions.

Syntax

I3HERE [**on** | **off** | **DRV**]

DRV	Enable INT 3 handling above 2GB only. This supports trapping of a driver's call to DebugBreak().

Use

Use the I3HERE command to specify that any interrupt 3 instruction pops up SoftICE. This feature is useful for stopping your program in a specific location.

To use this feature, set I3HERE on, and place an INT 3 instruction into your code immediately before the location where you want to stop. When the INT 3 occurs, it brings up the SoftICE screen. At this point, the current EIP is the instruction after the INT 3 instruction.

If you are developing a Windows program, the DebugBreak( ) Windows API routine performs an INT 3.

If you do not specify a parameter, the current state of I3HERE displays.

Note: If you are using an application debugging tool such as the Visual C debugger or Compuware's BoundsChecker, you should place INT 1 instructions in your code instead of INT 3 instructions. See *I1HERE* on page 164.

Example

The following example turns on I3HERE mode. Any INT 3s generated after this point cause SoftICE to pop up.

I3HERE on

When the command I3HERE==ON, and you are using a level -3 debugger, such as BoundsChecker, SoftICE traps on any INT 3 breakpoints installed by the level-3 debugger. The following example shows how to avoid this situation. Set I3HERE==OFF, and use the GENINT command to reactivate the breakpoint. This returns control to the level -3 debugger, and SoftICE does not trap further INT 3s.

```
I3HERE off
GENINT 3
```

See Also

GENINT; I1HERE; SET

IDT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Interrupt Descriptor Table.

Syntax

IDT [***int-number* | *IDT base-address***]

int-number	Interrupt number to display information
IDT base-address	IDT's base address and limit

Use

The IDT command displays the contents of the Interrupt Descriptor Table after reading the IDT register to obtain its address.

The IDT command without parameters displays the IDT's base address and limit, as well as the contents of all entries in the table. If you specify an optional interrupt-number or an IDT base address, only information about that entry is displayed.

For the Windows NT family

Almost all interrupt handlers reside in NTOSKRNL, so it is very useful to have exports loaded for it so that the handler names are displayed.

Note: NTOSKRNL must be the current symbol table (see *TABLE* on page 292) to view symbol names.

Output

Each line of the display contains the following information:

interrupt number	0 - 0FFh (5Fh for Windows 3.1, Windows 9x).

interrupt type	One of the following:

Type	Description
CallG32	32-bit Call Gate
CallG16	16-bit Call Gate
TaskG	Task Gate
TrapG16	16-bit Trap Gate
TrapG32	32-bit Trap Gate
IntG32	32-bit Interrupt Gate
IntG16	16-bit Interrupt Gate

address	Selector:offset of the interrupt handler.
selector's DPL	Selector's descriptor privilege level (DPL), which is either 0, 1, 2 or 3.
present bit	P or NP, indicating whether the entry is present or not present.
Owner+Offset	For Windows 9x and the Windows NT family only: Symbol or owner name plus the offset from that symbol or owner.

Example

The following command shows partial output of the IDT command with no parameters.

```
IDT
Int   Type      Sel:Offset     Attributes Symbol/Owner
IDTbase=C000ABBC  Limit=02FF
0000  IntG32    0028:C0001200  DPL=0  P   VMM(01)+0200
0001  IntG32    0028:C0001210  DPL=3  P   VMM(01)+0210
0002  IntG32    0028:C00EEDFC  DPL=0  P   VTBS(01)+1D04
0003  IntG32    0028:C0001220  DPL=3  P   VMM(01)+0220
0004  IntG32    0028:C0001230  DPL=3  P   VMM(01)+0230
0005  IntG32    0028:C0001240  DPL=3  P   VMM(01)+0240
0006  IntG32    0028:C0001250  DPL=0  P   VMM(01)+0250
0007  IntG32    0028:C0001260  DPL=0  P   VMM(01)+0260
0008  TaskG     0068:00000000  DPL=0  P
0009  IntG32    0028:C000126C  DPL=0  P   VMM(01)+026C
000A  IntG32    0028:C000128C  DPL=0  P   VMM(01)+028C
```

The following command shows the contents of one entry in the IDT.

```
IDT d

Int   Type     Sel:Offset     Attributes Symbol/Owner
000D  IntG32   0028:C00012B0  DPL=0  P   VMM(01)+02B0
```

INTOBJ

OS

Windows NT family

Type

System Information

Definition

Display information on system interrupt objects.

Syntax

INTOBJ [***vector*** | ***interrupt-object-address***]

Use

The INTOBJ command displays information about interrupt objects that are current in the system. If you enter INTOBJ without parameters, SoftICE lists all interrupt objects with the following information:

- Object Address
- Vector
- Service Address
- Service Context
- IRQL
- Mode
- Affinity Mask
- Symbol

If you issue the command with a vector or address, SoftICE displays information about the specified interrupt object.

Example

The following example displays information about all the current interrupt objects in the system.

```
INTOBJ

Object                Service   Service                   Affinity
Address    Vector     Address   Context     IRQL   Mode     Mask
Symbol
807D0D88     31      80802D90   807D1030     1A    Edge      01
80750D88     33      808030F0   807500F8     18    Edge      01
80750B08     34      808030F0   807513F8     17    Edge      01
807E0968     35      80802D30   807E1008     16    Edge      01
807E28A8     39      80802D50   807E9C48     12    Edge      01
80792D88     3B      80802ED0   8078D158     10    Level     01
807D18C8     3C      80802D70   807D1030     0F    Edge      01
808F2428     3E      8022BF58   808F2850     0D    Edge      01
SCSIPORT!.text+0C98
807EB428     3F      8022BF58   807EB850     0C    Edge      01
SCSIPORT!.text+0C98
```

The following example shows the information SoftICE displays for a particular interrupt object:

```
INTOBJ 31

Interrupt Object at 807D0D88
Length: 01E4
List Forward Link: 807D0D8C
Object List Back Link: 807D0D8C
Interrupt Service Routine address: 80802D90
Interrupt Service Routine context: 807D1030
Spinlock: 807D155C
Vector: 31
Device IRQL: 1A
Save Floating Point: FALSE
Processor Affinity Mask: 01
Processor Number: 00
Share interrupt: TRUE
Interrupt mode: Edge
```

IRB

OS

Windows NT family

Type

System Information

Definition

Decodes a 1394 I/O Request Block (IRB).

Syntax

IRB [-r] pirb

-r	Displays the reserved fields.
pirb	Pointer to the IRB.

Use

The IRB command will interpret and parse a 1394 IRB packet. The information that it displays is based on the information contained in the DDK header file 1394.h.

Note: The address specified will be assumed to be an IRB packet. There is no validation done, and it is the responsibility of the user to locate the IRB packet address.

Example

Some examples of IRB command usage are shown on the following two pages.

```
:IRB 0xFFA40C68
IRB at address FFA40C68
     FunctionNumber=0x6  (REQUEST_ISOCH_ATTACH_BUFFERS)
     Flags=0x0

     hResource             : 80CDB008
     nNumberOfDescriptors : 00000001
     pIsochDescriptor
       ISOCH_DESCRIPTOR (1 of 1)
         fulFlags                : 00000001
         Mdl                     : 80D48578
         ulLength                : 00025800
         nMaxBytesPerFrame       : 00000280
         ulSynch                 : 00000001
         ulTag                   : 00000000
         CycleTime
           CYCLE_TIME
            CL_CycleCount          : 00000000
            CL_CycleOffset         : 00000000
            CL_SecondCount         : 00000000
         Callback                : FC602C50
         Context1                : 80DAA390
         Context2                : FFA40C68
         status                  : 00000000
         DeviceReserved   [0]  : 00000001
         DeviceReserved   [1]  : 80D422B0
         DeviceReserved   [2]  : FF9F08D8
         DeviceReserved   [3]  : 00000000
         DeviceReserved   [4]  : 00000000
         DeviceReserved   [5]  : 00000000
         DeviceReserved   [6]  : 00000000
         DeviceReserved   [7]  : 00000000
```

```
:IRB -r 0xFFA40C68
IRB at address FFA40C68
     FunctionNumber=0x6  (REQUEST_ISOCH_ATTACH_BUFFERS)
     Flags=0x0

     hResource            : 80CDB008
     nNumberOfDescriptors : 00000001
     pIsochDescriptor
       ISOCH_DESCRIPTOR (1 of 1)
         fulFlags                 : 00000001
         Mdl                      : 80D48578
         ulLength                 : 00025800
         nMaxBytesPerFrame        : 00000280
         ulSynch                  : 00000001
         ulTag                    : 00000000
         CycleTime
           CYCLE_TIME
             CL_CycleCount            : 00000000
             CL_CycleOffset           : 00000000
             CL_SecondCount           : 00000000
         Callback                 : FC602C50
         Context1                 : 80DAA390
         Context2                 : FFA40C68
         status                   : 00000000
         DeviceReserved       [0] : 00000001
         DeviceReserved       [1] : 80D422B0
         DeviceReserved       [2] : FF9F08D8
         DeviceReserved       [3] : 00000000
         DeviceReserved       [4] : 00000000
         DeviceReserved       [5] : 00000000
         DeviceReserved       [6] : 00000000
         DeviceReserved       [7] : 00000000
         BusReserved          [0] : 00000000
         BusReserved          [1] : 00000000
         BusReserved          [2] : 00000000
         BusReserved          [3] : 00000000
         BusReserved          [4] : 00000000
         BusReserved          [5] : 00000000
         BusReserved          [6] : 00000000
         BusReserved          [7] : 00000000
         PortReserved         [0] : 00000000
         PortReserved         [1] : 00000000
         PortReserved         [2] : 00000000
         PortReserved         [3] : 00000000
         PortReserved         [4] : 00000000
         PortReserved         [5] : 00000000
         PortReserved         [6] : 00000000
         PortReserved         [7] : 00000000
:
```

See Also

IRP

IRP

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Displays information about an I/O Request Packet (IRP).

Syntax

`IRP [-f | -n | -p | -a]` ***`pirp`***

-f	Display all IRP stack locations.
-n	Display the next IRP stack location.
-p	Walk the previous IRP stack location.
-a	Iterates through all threads on a system and shows the IRP for each thread.
pirp	Pointer to the start of the IRP structure to be displayed.

Use

The IRP command displays the contents of the I/O Request Packet and the contents of associated current I/O stack located at the specified address. Note that the command does not check the validity of the IRP structure at the specified address, so any address will be accepted by SoftICE as an IRP address. Be careful to pass the IRP command a valid IRP address.

The IRP fields shown by SoftICE are not documented in their entirety here, as adequate information about them can be found in the DDK file NTDDK.H. A few fields deserve special mention, however, because device driver writers find them particularly useful:

Flags	Flags used to define IRP attributes.
StackCount	The number of stack locations that have been allocated for the IRP. A common device driver bug is to access non-existent stack locations, so this value may be useful in determining when this has occurred.

CurrentLocation	This number indicates which stack location is the current one for the IRP. Again, this value, combined with the previous StackCount, can be used to track down IRP stack-related bugs.
Cancel	This boolean is set to TRUE if the IRP has been cancelled as a result of an IRP cancellation call. This happens when the IRP's result is no longer needed so the IRP will not complete.
Tail.Overlay. CurrentStackLoc	Address of current stack location. The contents of this stack location are displayed after the IRP, as illustrated in the example of the command given below.
Cancel	This boolean is set to TRUE if the IRP has been cancelled as a result of an IRP cancellation call. An IRP may be cancelled when the IRP's result is no longer needed so that the IRP will not complete.

These fields in the current stack location may be useful:

Major Function and Minor Function	These fields indicate what type of request the IRP is being used for. The major function is used in determining which request handler will be called when an IRP is received by a device driver.
Device Object	Pointer to the device object at which the IRP is currently stationed. In other words, the IRP has been sent to, and is in the process of being received by, the device driver owning the device object.
File Object	Pointer to the file object associated with the IRP. It can contain additional information that serves as IRP parameters. For example, file system drivers use the file object path name field to determine the target file of a request.
Completion Routine	This field is set when a driver sets a completion routine for an IRP through the *IoSetCompletionRoutine* call. Its value is the address of the routine that will be called when a lower-level driver (associated with a stack location one greater than the current one) completes servicing of the IRP and signals that it has done so with *IoCompleteRequest*.

Example

The following example shows the output for the IRP command.

```
IRP eax
MdlAddress *        : 00000000
Flags               : 00000404
IRP_SYNCHRONOUS_API|IRP_CLOSE_OPERATION
AssociatedIrp       : 00000000
&ThreadListEntry    : FD8D9B18
IoStatus            : 00000000
RequestorMode       : 00
PendingReturned     : False
StackCount          : 03
CurrentLocation     : 03
Cancel              : False
CancelIrql          : 00
ApcEnvironment      : 00
Zoned               : True
UserIosb *          : FD8D9B20
UserEvent *         : FB11FB40
Overlay             : 00000000 00000000
CancelRoutine *     : 00000000
UserBuffer *        : 00000000

Tail.Overlay
    &DeviceQueueEntry : FD8D9B48
    Thread *          : FD80A020
    AuxiliaryBuffer * : 00000000
    &ListEntry        : FD8D9B60
    CurrentStackLoc * : FD8D9BC0
    OrigFileObject *  : FD819E08
Tail.Apc *          : FD8D9B48
Tail.ComplKey       : 00000000
CurrentStackLocation:
MajorFunction       : 12 IRP_MJ_CLEANUP
MinorFunction       : 00
Control             : 00
Flags               : 00
Others              : 00000000 00000000 00000000 00000000
DeviceObject *      : FD851E40
FileObject *        : FD819E08
CompletionRout *    : 00000000
Context *           : 00000000
```

See Also

IRB

IRQ

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display information about system hardware interrupts (IRQs).

Syntax

IRQ [***irq-number***]

irq-number	Specific IRQ to be displayed.

Use

The IRQ command will display information about the hardware interrupts (IRQs) in the system. Issuing the IRQ command with no parameters will display a list of all the hardware interrupts on the system, along with assigned vector and status information.

The output from this command differs depending on whether the machine is equipped with an 8259-style PIC, or an APIC. On a PIC machine, the IRQ command will report the vector and status (masked/unmasked) for each IRQ in the system. The vector field is an index into the system's Interrupt Descriptor Table, and can be used with the SoftICE IDT command to locate the interrupt service routine associated with a hardware interrupt. The status field indicates whether the hardware interrupt is currently masked at the interrupt controller.

On APIC systems, the IRQ command gets its information by reading the I/O APIC. The command displays the vector, delivery mode, status, trigger mode, and destination information for each IRQ. As with the PIC version of the IRQ command, the vector number is an offset into the system's IDT, and can be used to locate the interrupt service routine for the hardware interrupt. For a complete explanation of the other information reported by the IRQ command, refer to the I/O APIC documentation.

Example

The following example shows the output from the IRQ command on a machine equipped with a PIC:

```
IRQ
IRQ  Vector   Status
 00    30     Unmasked
 01    31     Unmasked
 02    32     Unmasked
 03    33     nmasked
 04    34     Unmasked
 05    35     Masked
 06    36     Masked
 07    37     Masked
 08    38     Unmasked
 09    39     Unmasked
 0A    3A     Masked
 0B    3B     Masked
 0C    3C     Unmasked
 0D    3D     Masked
 0E    3E     Unmasked
 0F    3F     Unmasked
```

And here is the output from the IRQ command on an APIC machine:

```
IRQ
Inti  Vector  Delivery  Status  Trigger  Dest Mode
Destination
01     93     Low. Pri  Idle    Edge     Logical    0 1
03     B2     Low. Pri  Idle    Edge     Logical    0 1
04     92     Low. Pri  Idle    Edge     Logical    0 1
08     D1     Fixed     Idle    Edge     Logical    0
09     B1     Low. Pri  Pending Level    Logical    0 1
0E     62     Low. Pri  Idle    Edge     Logical    0 1
0F     82     Low. Pri  Idle    Edge     Logical    0 1
10     83     Low. Pri  Pending Level    Logical    0 1
11     63     Low. Pri  Idle    Level    Logical    0 1
13     B4     Low. Pri  Pending Level    Logical    0 1
17     73     Low. Pri  Pending Level    Logical    0 1
I/O unit id register: 02000000
I/O unit version register: 00178020
```

One use of the IRQ command is in identifying the interrupt service routine associated with a particular device in the system. This final example illustrates using SoftICE commands to determine the address of the ISR for a USB host controller.

First, the USB command returns the PCI addresses of all the USB host controllers in the system:

```
USB

3 USB Host Controllers Found
   HC 0: UHCI at PCI Bus  0 Device 1F Function  2
   HC 1: UHCI at PCI Bus  0 Device 1F Function  4
   HC 2: OHCI at PCI Bus  4 Device  F Function  0
```

Next we use the PCI command to determine the interrupt line assigned to the host controller by the OS. In this case, we'll get the interrupt line for the first of the three host controllers listed above:

```
PCI 0 1f 2

Bus 00  Device 1F  Function 02
   Vendor: 8086Intel Corporation
   Device: 2442
   Revision: 04
   Device class:    0C Serial bus controller
   Device subclass: 03 Universal Serial Bus controller
   Device sub-subclass: 00
   Base address 4: 0000FF80  32 bytes  I/O
   Interrupt line:  13  Interrupt pin: 04  Min_Gnt: 00
MaxLat: 00

   Cache line size: 00  Latency timer: 00  Header type: 00
BIST: 00
   Command Register:
    I/O:1     Mem:0    BusMast:1  Special:0    MemInv:0
    Parity:0  Wait:0   SERR:0     Back2Back:0  Snoop:0
   Status Register:
    Caps:0    66MHz Cap:0  UDF:0  FB2B Cap:1  DevSel: Medium
    PERRDet:0 PERRRcvd:0 TASgnld:0  TARcvd:0  MARcvd:0
SERRSgnld:0
```

Notice that the interrupt line (bolded in this example) is set to 13 for this device. Now we issue the IRQ command, specifying the interupt line from the PCI command:

```
IRQ 13

Inti  Vector  Delivery  Status  Trigger  Dest Mode
Destination
13    B4      Low. Pri  Pending Level    Logical    0 1
I/O unit id register: 02000000
I/O unit version register: 00178020
```

This tells us that the interrupt vector assigned to this device is B4. Finally, we use the IDT command to get the address of the ISR:

```
IDT b4

Int    Type      Sel:Offset     Attributes Symbol/Owner
00B4   IntG32    0008:827D8BEC  DPL=0   P
```

The IDT command shows that the ISR address for this USB host controller is 0008:827D8BEC.

KEVENT

OS

Windows NT family

Type

System Information

Definition

Display Kernel Events.

Syntax

KEVENT [***kernel-event***]

kernel-event	Kernel event address.

Use

The KEVENT command displays information about kernel events that are current in the system. If you enter KEVENT without parameters, SoftICE walks through the BaseNamedObjects directory, where the Win32 subsystem typically stores named kernel objects, and displays the Kernel Events in that list. If you specify a kernel event address, SoftICE displays information about the specified event.

Example

The following example shows how to use the KEVENT command to display information about a specific event.

```
KEVENT 807AB730

Address  Type         State      Name
807AB730 Notification Signalled  LSA_RPC_SERVER_ACTIVE
```

See Also

KMUTEX; KSEM

KMUTEX

OS

Windows NT family

Type

System Information

Definition

Display information about kernel mutexes.

Syntax

KMUTEX [***kernel-mutex***]

kernel-mutex	Kernel mutex address

Use

If you issue the KMUTEX command without any parameters, SoftICE walks through the BaseNamedObjects directory, where the Win32 subsystem typically stores named kernel objects, and displays information about all the Kernel mutexes in that list.

If you issue the KMUTEX command with an expression, SoftICE displays information about the kernel mutex at that address.

Example

The following example shows how to use the KEVENT command to display information about a specific object.

```
KMUTEX 80733470

Address  State     Own.KTEB(TID) Aban APC Name
80733470 Signalled        0(  0) N    0   OLESharedTablesMutex
```

See Also

FMUTEX; KEVENT; KSEM

KSEM

OS

Windows NT family

Type

System Information

Definition

Display information about kernel semaphores.

Syntax

KSEM [***semaphore-address***]

semaphore -address	Address of a kernel semaphore object.

Use

If you issue the KSEM command without any parameters, SoftICE walks through the BaseNamedObjects directory, where the Win32 subsystem typically stores named kernel objects, and displays information about all the Kernel semaphores in that list.

If you issue the KSEM command with an expression, SoftICE displays information about the kernel semaphores at that address.

Example

The following example shows how to use the KSEM command to display information about a specific semaphore object.

```
KSEM 807060F0

Address  Limit    State      Name
807060F0 1        Signalled  NDDEAgent
```

See Also

KEVENT; KMUTEX

LDT

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Local Descriptor Table.

Syntax

LDT [***selector***]

selector	Starting LDT selector to display.

Use

The LDT command displays the contents of the Local Descriptor Table after reading its location from the LDT register. If there is no LDT, an error message will be printed. If you specify an optional selector, only information on that selector is displayed. If the starting selector is a Global Descriptor Table (GDT) selector (that is, bit 2 is 0), the GDT displays rather than the LDT. The first line of output contains the base address and limit of the LDT.

For Windows 9x and the Windows NT family

Even when there is no LDT, the LDT command can display an LDT you supply as a command parameter. This optional parameter can be a GDT selector that represents an LDT. You can locate selectors of type LDT with the GDT command.

For the Windows NT family

The LDT command is process specific and only works in processes that have an LDT. Use the ADDR command to determine which processes contain LDTs. Use ADDR to switch to those processes, then use the LDT command to examine their LDTs.

Output

Each line of the display contains the following information:

selector value — Lower two bits of this value reflect the descriptor privilege level.

selector type

Type	Description
Code16	16-bit code selector
Data16	16-bit data selector
Code32	32-bit code selector
Data32	32-bit data selector
CallG32	32-bit Call Gate selector
CallG16	16-bit Call Gate selector
TaskG32	32-bit Task Gate selector
TaskG16	16-bit Task Gate selector
TrapG32	32-bit Trap Gate selector
TrapG16	16-bit Trap Gate selector
IntG32	32-bit Interrupt Gate selector
IntG16	16-bit Interrupt Gate selector
Reserved	Reserved selector

selector base — Linear base address of the selector.

selector limit — Size of the selector.

selector DPL — Selector's descriptor privilege level (DPL), either 0, 1, 2 or 3.

present bit — P or NP, indicating whether the selector is present or not present.

segment attributes — One of the following:

Type	Description
RW	Data selector is readable and writable.
RO	Data selector is read only.
RE	Code selector is readable and executable.
EO	Code selector is execute only.
B	TSS's busy bit is set.

Example

The following example shows sample output for the LDT command.

```
LDT

Sel.  Type      Base      Limit     DPL  Attributes
LDTbase=8008B000  Limit=4FFF
0004  Reserved  00000000  00000000  0    NP
000C  Reserved  00000000  00000000  0    NP
0087  Data16    80001000  00000FFF  3    P   RW
008F  Data16    00847000  0000FFFF  3    P   RW
0097  Data16    0002DA80  0000021F  3    P   RW
009F  Data16    00099940  000029FF  3    P   RW
00A7  Data16    0001BAC0  000000FF  3    P   RW
00AF  Data16    C11D9040  0000057F  3    P   RW
```

LHEAP

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Windows local heap.

Syntax

LHEAP [***selector*** | ***module-name***]

selector	LDT data selector.
module-name	Name of any 16-bit module.

Use

The LHEAP command displays the data objects that a Windows program has allocated on the local heap. If you do not specify a selector, the value of the current DS register is used. The specified selector is usually the Windows program's data selector. To find this, use the HEAP command on the Windows program you are interested in and look for an entry of type data. Each selector that contains a local heap is marked with the tag LH.

If a module-name is entered, SoftICE uses the modules default data segment for the heap walk.

For Windows 9x and the Windows NT family

To find all segments that contain a local heap, use the HEAP command with the -L option.

For the Windows NT family

The LHEAP command only works if the current process contains a WOW box.

Output

For each local heap entry the following information displays:

offset	16-bit offset relative to the specified selector base address.
size	Size of the heap entry in bytes.
type	Type of entry. One of the following:

Type	Description
FIX	Fixed (not moveable)
MOV	Moveable
FREE	Available memory

handle	Handle associated with each element. For fixed elements, the handle is equal to the address that is returned from LocalAlloc( ). For moveable elements, the handle is the address that will be passed to LocalLock( ).

At the end of the list, the total amount of memory in the local heap displays.

Example

The following command displays all local heap entries belonging to the GDI default local heap.

```
LHEAP gdi


Offset          Size            Type            Handle
93D2            0046            Mov             0DFA
941E            0046            Mov             0C52
946A            0046            Mov             40DA
94B6            004E            Mov             0C66
950A            4A52            Mov             0E52
Used: 19.3K
```

LINES

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Change the number of lines for the SoftICE display.

Syntax

For Windows 3.1

LINES [**25** | **43** | **50**]

For Windows 9x and the Windows NT family

With Universal Video Driver:

LINES numlines

numlines	Number of screen lines. Set this to any value from 25 to 128.

With VGA Text Video Driver:

LINES [**25** | **43** | **50** | **60**]

Use

The LINES command changes SoftICE's character display mode. For VGA Text Driver displays, it allows different display modes: 25-line, 43-line, 50-line, and 60-line mode. The 50-, and 60-line modes are only valid on VGA display adapters. For the Universal Video Driver, you can specify any number of lines greater than 25.

Using LINES with no parameters displays the current state of LINES. The default number of display lines is 25.

If you enter the ALTSCR command, SoftICE changes to 25-line mode automatically. If you change back to a VGA display and want a larger line mode, enter the LINES command again. To display in 50-line mode on a serial terminal, first place the console mode of the serial terminal into 50-line mode using the DOS MODE command.

For Windows 9x and the Windows NT family

You can display 60 lines for single monitor debugging.

When debugging in serial mode, all line counts are supported for VGA displays.

Example

The following command changes the SoftICE display to 53 lines using the Universal Video Driver. The current font affects the number of lines SoftICE can display.

```
LINES 53
```

See Also

SET; WIDTH

LOCALS

OS

Windows 9x and the Windows NT family

Type

Symbol/Source Command

Definition

List local variables from the current stack frame.

Syntax

```
LOCALS
```

Use

Use the LOCALS command to list local variables from the current stack frame to the Command window.

Output

The following information displays for each local symbol:

- Stack Offset
- Type definition
- Value, Data, or structure symbol ({...})

The type of the local variable determines whether a value, data, or structure symbol ({...}) is displayed. If the local is a pointer, the data it points to is displayed. If it is a structure, the structure symbol is displayed. If the local is neither a pointer nor a structure, its value is displayed.

Note: You can expand structures, arrays, and character strings to display their contents. Use the WL command to display the Locals window, then double-click the item you want to expand. Expandable items are delineated with a plus (+) mark.

Example

The following example displays the local variables for the current stack frame.

```
LOCALS
[EBP-4] struct_BOUNCEDATA * pdb=0x0000013F <{...}>
[EBP+8] void * hWnd=0x000006D8
```

See Also

TYPES; WL

M

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Move data.

Syntax

M *source-address* l *length dest-address*

source-address	Start of address range to move.
length	Length in bytes.
dest-address	Start of destination address range.

Use

The specified number of bytes are moved from the source-address to the dest-address.

Example

The following command moves 2000h bytes (8KB) from memory location DS:1000h to ES:5000h.

```
M ds:1000 l 2000 es:5000
```

MACRO

OS

Windows 9x and the Windows NT family

Type

Customization

Definition

Define a new command that is a superset of SoftICE commands.

Syntax

MACRO [***macro-name***] | [*] | [= "***macro body***"]

macro-name	Case-insensitive, 3-8 character name for the macro being defined, or the name of an existing macro.
macro-body	Quoted string that contains a list of SoftICE commands and parameters separated by semi-colons (;).
*	Delete one or all defined macros.
=	Define (or redefine) a macro.

Use

The MACRO command is used to define new Macro commands that are supersets of existing SoftICE commands. Defined macros can be executed directly from the SoftICE command line. The MACRO command is also used to list, edit, or delete individual macros. Macros are directly related to breakpoint actions, as breakpoint actions are simply macros that do not have names, and can only be executed by the SoftICE breakpoint engine.

If no options are provided, a list of all defined macros will be displayed, or if a macro-name is specified, that macro will be inserted into the command buffer so that it can be edited.

When defining or redefining a macro, the following form of the macro command is used:

```
MACRO macro-name = "macro-body"
```

The macro-name parameter can be between 3 and 8 characters long, and may contain any alphanumeric character and underscores (_). If the macro-name parameter specifies an existing macro, the MACRO command redefines the existing macro. The macro-name cannot be a duplicate of an existing SoftICE command. The macro-name must be followed by an equal sign “=”, which must be followed by the quoted string that defines the macro-body.

The macro-body parameter must be embedded between beginning and ending quotation marks (“). The macro-body is made up of a collection of existing SoftICE commands, or defined macros, separated by semi-colons. Each command may contain appropriate ‘literal’ parameters, or can use the form %<parameter#>, where parameter# must be between 1 and 8. When the macro is executed from the command line, any parameter references will expand into the macro-body from the parameters specified when the command was executed. If you need to embed a literal quote character (”) or a percent sign (%) within the macro body precede the character with a backslash character (\). Since the backslash character is used for escape sequences, to specify a literal backslash character, use two consecutive backslashes (\\). The final command within the macro-body does not need to be terminated by a semi-colon.

You can define macros in the SoftICE Loader using the same syntax described here. When you load SoftICE, each macro definition is created and available for use. SoftICE displays a message for each defined macro to remind you of its presence. Since macros consume memory, you can set the maximum number of named and unnamed macros (that is, breakpoint actions) that can be defined during a SoftICE session. The default value of 32 is also the minimum value. The maximum value is 256.

Note: A macro-body cannot be empty. It must contain one or more non-white space characters. A macro-body can execute other macros, or define another macro, or even a breakpoint with a breakpoint action. A macro can even refer to itself, although recursion of macros is not extremely useful because there is no programmatic way to terminate the macro. Macros that use recursion execute up to the number of times that SoftICE permits (32 levels of recursion are supported), no more and no less. Even with this limitation, macro recursion can be useful for walking nested or linked data structures. To get a recursive macro to execute as you expect, you have to devise clever macro definitions.

Example

The following example uses the MACRO command without parameters or options.

```
MACRO
XWHAT    = "WHAT EAX;WHAT EBX;WHAT ECX; WHAT EDX; WHAT ESI;
WHAT EDI"
OOPS     = "I3HERE OFF;GENINT 3"
1shot    = "bpx eip do \"bc bpindex \""
```

Note: The name of the macro is listed to the left, and the macro body definition to the right.

The following examples show other basic uses for the MACRO command:

Command	Description
MACRO *	Delete all named macros.
MACRO oops *	Delete the macro named oops.
MACRO xwhat	Edit the macro named xwhat.

Note: Since macros can be redefined at any time, when you use the edit form of the MACRO command (MACRO *macro-name*) the macro definition will be placed in the edit buffer so that it can be edited. If you do not wish to modify the macro, press ESC. The existing macro will remain unchanged. If you modify the macro-body without changing the macro name, the macro will be redefined (assuming the syntax is correct!)

The following example is a simple macro definition:

```
MACRO help = “h”
```

The next example uses a literal parameter within the macro-body. Its usefulness is limited to specific situations or values.

```
MACRO help = “h exp”
```

In the previous example, the SoftICE H command is executed with the parameter EXP every time the macro executes. This causes the help for the SoftICE EXP command to display.

This is a slightly more useful definition of the same macro:

```
MACRO help = "help %1"
```

In the revised example, an optional parameter was defined to pass to the SoftICE H command. If the command is executed with no parameters, the argument to the H command is empty, and the macro performs exactly as the first definition; help for all commands is displayed. If the macro executes with 1 parameter, the parameter is passed to the H command, and the help for the command specified by parameter 1 is displayed. For execution of macros, all parameters are considered optional, and any unused parameters are ignored.

The following are examples of legal macro definitions:

```
MACRO qexp = "addr explorer; query %1" qexp
or
qexp 1 40000

MACRO 1shot = "bpx %1 do \"bc bpindex\""  1shot eip
or
1shot @esp

MACRO ddt = "dd thread" ddt
MACRO ddp = "dd process" ddp


MACRO thr = "thread %1 tid" thr
or
thr -x
```

The following are examples of *illegal* macro definitions, with an explanation and a corrected example.

Illegal Definition:	~~MACRO dd = "dd dataaddr"~~
Corrected Example:	MACRO dda = "dd dataaddr"
Explanation:	The macro name is a duplication of a SoftICE command name. SoftICE commands cannot be redefined.
Illegal Definition:	~~MACRO aa = "addr %1"~~

Illegal Definition:	~~MACRO dd = “dd dataaddr”~~
Corrected Example:	MACRO aaa = “addr %1”
Explanation:	The macro command name is too short. A macro name must be between 3 and 8 characters long.
Illegal Definition:	~~MACRO pbsz = ? hibyte(hiword(*(%1-8))) << 5~~
Corrected Example:	MACRO pbsz = “? hibyte(hiword(*(%1-8))) << 5”
Explanation:	The macro body must be surrounded by quote characters (“).
Illegal Definition:	~~MACRO tag = “? *(%2-4)”~~
Corrected Example:	MACRO tag = “? *(%1-4)”
Explanation:	The macro body references parameter %2 without referencing parameter %1. You cannot reference parameter %n+1 without having referenced parameter %n.

MAP32

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display a memory map of all 32-bit modules currently loaded in memory.

Syntax

For Windows 3.1

MAP32 [**-u** | **-s**] | [***module-name*** | ***module-handle***]

-u	Displays only modules in user space.
-s	Displays only modules in system space.
module-name	Windows module-name.
module-handle	Base address of a module image.

For Windows 9x and the Windows NT family

MAP32 [***module-name*** | ***module-handle*** |***address***]

module name	Windows module-name.
module handle	Base address of a module image.
address	Any address that falls within an executable image.

Use

MAP32 with no parameters lists information about all 32-bit modules.

If you specify either a module-name or module-handle as a parameter, only sections from the specified module are shown. For each module, one line of data is printed for every section belonging to the module.

Since the MAP32 command takes any address that falls within an executable image, an easy way to see the memory map of the module that contains the current EIP is to enter:

MAP32 eip

For Windows 9x

No matter what process/context you are in, MAP32 shows the same list of drivers because memory above 2GB is globally mapped. However, MAP32 shows different lists of applications/DLLs depending on the current process or context, because they are *always* private to an address context.

For the Windows NT family

MAP32 lists kernel drivers as well as applications and DLLs that exist in the current process. They can be distinguished in the map because drivers always occupy addresses above 2GB, while applications and DLLs are always below 2GB.

Output

Each line in MAP32's output contains the following information:

Owner Module name.

Name Section name from the executable file.

Obj# Section number from the executable file.

Address Selector:offset address of the section.

Size Section's size in bytes.

Type Type and attributes of the section, as follows:

Type	Attributes
CODE	Code
IDATA	Initialized Data
UDATA	Uninitialized Data
RO	Read Only
RW	Read/Write
SHARED	Object is shared

Example

For Windows 3.1

The following example illustrates sample output for MAP32 executed on a Visual C module.

```
MAP32 msvcrt10

Owner       Obj Name   Obj#  Address           Size        Type
MSVCRT10    .text      0001  2197:86C81000     00024A00    CODE RO
MSVCRT10    .bss       0002  219F:86CA6000     00001A00    UDATA RW
MSVCRT10    .rdata     0003  219F:86CA8000     00000200    IDATA RO
MSVCRT10    .edata     0004  219F:86CA9000     00005C00    IDATA RO
MSVCRT10    .data      0005  219F:86CAF000     00006A00    IDATA RW
MSVCRT10    .idata     0006  219F:86CB6000     00000A00    IDATA RW
MSVCRT10    .reloc     0007  219F:86CB7000     00001800    IDATA RO
```

MAPV86

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the MS-DOS memory map of the current Virtual Machine.

Syntax

MAPV86 [***address***]

address	Segment:offset type address.

Use

If no address parameter is specified, a map of the entire current virtual machine’s V86 address space is displayed. Information about the area in the map where a certain address lies can be obtained by specifying the address.

Pages of DOS VM memory may not be valid (not mapped in) when you enter the MAPV86 command. If this occurs, the output from the MAPV86 command will terminate with a PAGE NOT PRESENT message. Often, just popping out of, and then back into, SoftICE will result in those pages being mapped in.

A useful application of the MAPV86 command is in obtaining addresses to which a symbol table must be aligned with the SYMLOC command. DOS programs that were started before Windows will not automatically have their symbol information mapped to their location in V86 memory. You can enable source-level debugging for these global DOS programs by performing the following steps.

- Use the MAPV86 command to get the starting address of the programs static code segment. Add 10h to the address if the program in an executable (.EXE).
- Use the SYMLOC command to set the symbol table alignment to that value.

For the Windows NT family

The MAPV86 command is process specific. You must be in an NTVDM process because this process is the only one that can contain V86 boxes. There is no *global* MS-DOS used in the Windows NT family.

Output

For Windows 3.1 and Windows 9x

The following summary information is displayed by the MAPV86 command.

VM ID	Virtual machine (VM) ID. VM1 is the System VM.
VM handle	32-bit virtual machine handle.
CRS pointer	VM's 32-bit client register structure pointer.
VM address	32-bit linear address of the VM. This is the *high linear* address of the virtual machine, which is also currently mapped to linear address 0.

If the current CS:IP belongs to a MAPV86 entry, that line will be highlighted. Each line of the MAPV86 display contains the following information:

Start	Segment:offset start address of the component.
Length	Length of the component in paragraphs.
Name	Owner name of the component.

Example

The following example illustrates how to use the MAPV86 command to display the entire V86 map for the current VM.

```
MAPV86

ID=01 Handle=80441000 CRS Ptr=80013390 Linear=80C00000
Start          Length         Name
0000:0000      0040           Interrupt Vector Table
0040:0000      0030           ROM BIOS Variables
0070:0000      025D           I/O System
02CD:0000      08E6           DOS
```

```
MAPV86

ID=01 Handle=80441000 CRS Ptr=80013390 Linear=80C00000
Start              Length             Name
0BB5:0012          0000               NUMEGA
0C8B:0000          00E8               SOFTICE1
0D41:0000          00B6               XMSXXXX0
10D0:0000          038F               SMARTAAR
```

MOD

OS

Windows 3.1

Type

System Information

Definition

Display the Windows 3.1 module list.

Syntax

MOD [***partial-name***]

partial-name	Prefix of the Windows module name.

Use

This command displays the Windows module list in the Command window. A module is a Windows application or DLL. All 16-bit modules will be displayed first, followed by all 32 bit modules. If a partial name is specified, only those modules that begin with the name will be displayed.

Output

For each loaded module the following information is displayed:

Tip: *For Windows 9x and the Windows NT family, refer to MOD on page 211.*

module handle	16-bit handle that Windows assigns to each module. It is actually a 16-bit selector of the module database record which is similar in format to the EXE header of the module file.
pe-header	Selector:offset of the PE File header for that module. *Note:* A value is only displayed in this column for 32-bit modules.
module name	Name specified in the .DEF file using the 'NAME' or 'LIBRARY' keyword.
file name	Full path and file name of the module's executable file.

Example

The following example shows abbreviated output of MOD to display all modules in the system:

```
MOD

hMod  PEHeader      Module Name .EXE File Name
0117                KERNEL      C:\WINDOWS\SYSTEM\KRNL386.EXE
0147                SYSTEM      C:\WINDOWS\SYSTEM\SYSTEM.DRV
014F                KEYBOARD    C:\WINDOWS\SYSTEM\KEYBOARD.DRV
0167                MOUSE       C:\WINDOWS\SYSTEM\LMOUSE.DRV
01C7                DISPLAY     C:\WINDOWS\SYSTEM\VGA.DRV
01E7                SOUND       C:\WINDOWS\SYSTEM\MMSOUND.DRV
0237                COMM        C:\WINDOWS\SYSTEM\COMM.DRV
0000  2987:80756080 W32SKRNL    C:\WINDOWS\SYSTEM\win32s\w32skrnl.dll
12C7  2987:86C20080 FREECELL    C:\WIN32APP\FREECELL\FREECELL.EXE
1FC7  2987:86C40080 CARDS       C:\WIN32APP\FREECELL\CARDS.dll
1FDF  2987:86C70080 w32scomb    C:\WINDOWS\SYSTEM\win32s\w32scomb.dll
```

See Also

For Windows 9x and the Windows NT family, refer to *MOD* on page 211.

MOD

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display the Windows module list.

Syntax

MOD [**-u** | **-s**] | [***partial-name****]

-u	Displays only modules in user space.
-s	Displays only modules in system space.
partial-name	Prefix of the Windows module name

Use

This command displays the Windows module list in the Command window. If a partial name is specified, only modules that begin with the name will be displayed. SoftICE displays modules in the following order:

Tip: For Windows 3.1, refer to MOD on page 209.

- 16-bit modules
- 32-bit driver modules (Windows NT family only)
- 32-bit application modules

For Windows 9x

The module list is global. A module is a Windows application or DLL. All modules have an hMod value.

For the Windows NT family

The Mod command is process specific. All modules will be displayed that are visible within the current process. This includes all 16-bit modules, all 32-bit modules, and all driver modules. This means if you want to see specific modules, you must switch to the appropriate address context before using the MOD command.

You can distinguish application modules from driver modules because application modules have base addresses below 2GB (80000000h).

The 16-bit modules will be the only modules that have an hMod value.

Output

For each loaded module the following information is displayed:

module handle	16-bit handle that Windows assigns to each module. It is actually a 16-bit selector of the module database record which is similar in format to the EXE header of the module file.
base	Base linear address of the executable file. This is also used as the module handle for 32-bit executables. *Note:* A value is only displayed in this column for 32-bit modules.
pe-header	Selector:offset of the PE File header for that module. *Note:* A value is only displayed in this column for 32-bit modules.
module name	Name specified in the .DEF file using the 'NAME' or 'LIBRARY' keyword.
file name	Full path and file name of the module's executable file.

Example

The following abbreviated example shows MOD on the NTVDM WOW process:

```
MOD

hMod Base     PEHeader ModuleName File Name
021F                   KERNEL     D:\WINNT35\SYSTEM32\KRNL386.EXE
020F                   SYSTEM     D:\WINNT35\SYSTEM32\SYSTEM.DRV
01B7                   KEYBOARD   D:\WINNT35\SYSTEM32\KEYBOARD.DRV
02B7                   MOUSE      D:\WINNT35\SYSTEM32\MOUSE.DRV
02CF                   DISPLAY    D:\WINNT35\SYSTEM32\VGA.DRV
02E7                   SOUND      D:\WINNT35\SYSTEM32\SOUND.DRV
0307                   COMM       D:\WINNT35\SYSTEM32\COMM.DRV
031F                   USER       D:\WINNT35\SYSTEM32\USER.EXE
0397                   GDI        D:\WINNT35\SYSTEM32\GDI.EXE
0347                   WOWEXEC    D:\WINNT35\SYSTEM32\WOWEXEC.EXE
03DF                   SHELL      D:\WINNT35\SYSTEM32\SHELL.DLL
0C3F                   WFWNET     D:\WINNT35\SYSTEM32\WFWNET.DRV
0BFF                   MMSYSTEM   D:\WINNT35\SYSTEM32\MMSYSTEM.DLL
```

```
MOD

hMod Base      PEHeader ModuleName File Name
0BF7                    TIMER      D:\WINNT35\SYSTEM32\TIMER.DRV
     80100000           ntoskrnl   \WINNT35\System32\ntoskrnl.exe
     80100080
     80400000           hal        \WINNT35\System32\hal.dll
     80400080
     80010000           atapi      atapi.sys
     80010080
     80013000           SCSIPORT   \WINNT35\System32\Drivers\SCSIPO
     80013080                      RT.SYS
     80001000           Atdisk     Atdisk.sys
     80001080
     8001B000           Scsidisk   Scsidisk.sys
     8001B080
     803AE000           Fastfat    Fastfat.sys
     803AE080
     FB000000           Floppy     \SystemRoot\System32\Drivers\Flo
     FB000080                      ppy.SYS
     FB010000           Scsicdrm   \SystemRoot\System32\Drivers\Scs
     FB010080                      icdrm.SYS
     FB020000           Fs_Rec     \SystemRoot\System32\Drivers\Fs_
     FB020080                      Rec.SYS
```

See Also

For Windows 3.1, refer to *MOD* on page 209.

MSR

OS

Windows 98, Windows Me, and the Windows NT family

Type

System Information

Definition

Display or write to the Model Specific Registers.

Syntax

MSR [[-u] [begin-reg [end-reg] | [-w reg [hidword_val] lowdword_val]"

-u	Show unreadable registers.
begin-reg	Starting register to display.
end-reg	Ending register to display.
-w	Write to a register.
reg	Identity of the register.
hidword_val	Write to the upper 32 bits of the register.
lowdword_val	Write to the lower 32 bits of the register.

Use

The MSR command is used to display or write to the Model Specific Registers. When no options are given to the MSR command, SoftICE will attempt to display all of these registers including the Value, Architectural Name, Read/Write flags, and Description. If you read a register that SoftICE does not have internal knowledge of, SoftICE will display the register number and its 64-bit value.

SoftICE has internal knowledge of the registers that make up the "Architectural MSRS" as defined in Volume 3 of the *Pentium 4 System Programming Guide* documentation from Intel.

Caution: **Not all registers are available on all platforms. SoftICE makes no attempt to validate MSR writing. Writing to the Model Specific Registers has the potential to be very dangerous. Be certain of the destination and the value that you are writing.**

Example

The following examples show the output from the MSR command.

In the first example, SoftICE displays all MSR registers from 0x10 through 0x20:

```
MSR 0x10 0x20
Reg  Value              Acc ID Name              Description
10   00000028:E03DB054  RW  IA32_TIME_STAMP_CTR Time Stamp
Counter
17   00000028:E03DB054  RW
18   00000000:00000000
1B   00000000:FEE00100   RW  IA32_APIC_BASE      APIC Location
and Status
```

This time SoftICE displays non-readable registers. This is useful for finding undocumented Model Specific Registers.

```
MSR -u 0x10 0x17
Reg  Value              Acc ID Name              Description
10   0000002C:3B6C9262  RW  IA32_TIME_STAMP_CTR Time Stamp
Counter
NTICE: Error reading MSR 0x11
NTICE: Error reading MSR 0x12
NTICE: Error reading MSR 0x13
NTICE: Error reading MSR 0x14
NTICE: Error reading MSR 0x15
NTICE: Error reading MSR 0x16
17   20410000:00000000   R  IA32_PLATFORM_ID    Platform ID
```

In the final example, the Time Stamp Counter Register is read and then reset.

Note: This action causes the SoftICE blinking cursor to stop functioning until a popdown.

```
MSR 10
Reg  Value              Acc ID Name              Description
10   0000002D:62496928  RW  IA32_TIME_STAMP_CTR Time Stamp
Counter
MSR -w 10 0
MSR 10
Reg  Value              Acc ID Name              Description
10   00000000:2E350910  RW  IA32_TIME_STAMP_CTR Time Stamp
Counter
```

NAME

OS

Windows NT family

Type

Symbol/Source Commands

Definition

Assign a name to an address in memory.

Syntax

NAME [-d] [address] [name]

-d	Delete the specified name.
address	32-bit address or selector:address
name	The name to assign to the address.

Use

The NAME command is used to assign a name to an address. Assigned names will be displayed by SoftICE in the data display and disassembly windows, and can also be resolved by the expression evaluator.

User-defined names can be used to set “bookmarks” in code or data. You can name the first instruction of a disassembled routine for which you do not have source code, and return to the routine later using the U (unassemble) command. Similarly, a named data address can be displayed using any of the data display commands with the user-defined name.

Issuing the NAME command with no parameters will cause all of the defined names to be displayed. The NAME command with an address or name will display any existing names matching the given parameter. Wildcards are supported, so ‘NAME my*’ will display all defined names beginning with the characters ‘my’.

Although the NAME command allows selectors to be specified when defining a name (with the usual selector:offset format), selectors are ignored when searching for a name to match an address. In other words, the NAME command assumes a flat address model.

Names defined in application space – all addresses below 80000000h on most Windows platforms – are associated with the address context that was current when the name was defined. This means that names defined in application space will be local to a single application, and will not be displayed in another application's address space, even though the actual address may be the same.

Names defined with this command will always use absolute addresses. If the module containing the named address is unloaded, and subsequently reloaded at a different address, all defined names will still point to the old, and now incorrect, addresses.

User-defined names co-exist with symbols defined in any loaded symbol or export tables. You can also set names within and around routines for which you have symbol names loaded. User-defined names do not show up if you are viewing code in source mode.

SoftICE allocates memory for the name command at startup. By default, 256 names are supported (the actual number of names you can set will be fewer if you use particularly long strings for your names), but the number of entries can also be controlled by adding a **NAMES= entry** to the **winice.dat** file. For example, adding **NAMES=400** to the winice.dat file will cause SoftICE to allocate memory for 400 names when it is started.

The NAME command is included on the popup mouse menu by default. To use this feature, simply right-click on an address anywhere in the SoftICE window, and select 'NAME' from the popup window. You will then need to complete the command by typing the name on the command line.

Example

Here is an example of setting a name on an address in the disassembly window. First the original disassembly window contents:

```
0008:805382E5  MOV       ESI,[EBP+08]
0008:805382E8  PUSH      EDI
0008:805382E9  JZ        805383AF
```

Now the enter the NAME command:

```
NAME 805383AF MysteryAddress1
```

The disassembled fragment now looks like this:

```
0008:805382E5  MOV       ESI,[EBP+08]
0008:805382E8  PUSH      EDI
0008:805382E9  JZ        MysteryAddress1
```

You can now enter

```
U MysteryAddress1
```

and SoftICE will disassemble the code starting at that address.

Note that setting a name on EBP+08 in the disassembly routine would succeed, but would not necessarily produce the desired result. This is because SoftICE would use the current value of EBP, whatever it happened to be at the time the command was issued. If the execution point was within the routine containing the code, and the stack frame had been set up, the name might well point at the correct address. If not, it could point anywhere. Use care when assigning names to addresses indexed with registers.

Finally, suppose you've created a number of names and now wish to delete them. Use

```
NAME -d *
```

to delete all defined names. To be more selective about the deletion, you might enter

```
NAME -d Mystery*
```

which would delete all names beginning with 'Mystery', leaving all others intact.

NET

OS

Windows 9x and the Windows NT family

Type

Customization

Definition

Remote debugging over standard IP ethernet connection.

Syntax

NET START <***target-IP-address*** | ***DHCP*** > [**MASK=*subnet-mask***] [**GATEWAY=*IP-address***]

target-IP-address	IP-address of the machine on which you are running SoftICE.
DHCP	Dynamic Host Configuration Protocol. Instructs SoftICE to get the IP parameters from your network DHCP server.
MASK=subnet-mask	The network subnet mask.
GATEWAY=ip-address	The IP address of the network gateway.

NET ALLOW <***remote-IP-address*** | ***ANY*** > [**AUTO**] [**PASSWORD=*password***]

ANY	Allows a machine from any IP address to connect to the target machine.
AUTO	Allows a remote machine that has connected successfully to reconnect. This is useful if the remote machine loses its connection and must reconnect. If AUTO is not specified, you must reissue the NET ALLOW command on the target machine before another connection can be made.
PASSWORD=password	A case-sensitive password that is required of users to get access to SoftICE on the target machine.

NET COMx <baud-rate>

x	COM port number. Valid values are 1 through 4. This command uses only standard port addresses.
baud-rate	Any legal baud rate between 1200 and 115200

```
NET PING IP-address
NET RESET
NET STOP
NET HELP
NET STATUS
```

Use

You can use the NET commands to run SoftICE on one machine (the *target* machine,) so that it can be controlled remotely over a standard internet connection from another machine (the *remote* machine.) To run SoftICE remotely you must replace the adapter driver file on the target machine, with one provided in the SoftICE distribution. For details on setting up the target machine, refer to the section "Configuring Remote Debugging" in Chapter 10, "Customizing SoftICE," in the *Using SoftICE* document

After installing the network adapter and driver, you can use the following NET command options on the target machine to enable SoftICE to be controlled by the remote machine.

The NET START command enables the IP stack in SoftICE. This command identifies your IP parameters to SoftICE (IP-address, subnet-mask, and gateway address). If your local network supports DHCP (Dynamic Host Configuration Protocol), you can tell SoftICE to obtain the IP parameters from your network DHCP server. At this point, the IP stack is running, but SoftICE does not allow remote debugging until you use the NET ALLOW command to specify what other machine(s) can control SoftICE.

The NET ALLOW command tells SoftICE how to determine which machine(s) can be used to remotely control SoftICE. A remote machine can be specified as a specific IP address or ANY IP address. Access to control SoftICE can also be qualified by a case-sensitive password.

The NET COMx command allows you to establish a remote debugging session over a serial connection, including the ability to control the mouse and SoftICE window remotely.

The NET PING command allows you to do a basic network connectivity test by sending an ICMP Echo Request (PING) packet to an IP address. SoftICE sends the request and indicates whether it receives a response within 4 seconds.

The NET RESET command terminates any active remote debugging session (IP or serial connection) and cancels the effect of the previous NET ALLOW command.

The NET STOP command terminates any active remote debugging session (IP or serial connection) and cancels the effect of the previous NET ALLOW command. It also disables the IP stack.

The NET HELP command shows a list of the available network commands with their respective syntax.

The NET STATUS command shows the current status of the network adapter. It displays the current IP parameters (IP address, subnet mask, and gateway) and the status of the remote debugging connection.

After the target machine is set up correctly, you issue the SIREMOTE command on the remote machine to create the connection to the target machine. To use SIREMOTE, you must copy SIREMOTE.EXE from the SoftICE installation directory to the remote machine. The syntax for the SIREMOTE command is:

```
SIREMOTE <target-IP-address> [password]
```

The syntax for the SIREMOTE command with a serial connection is:

```
SIREMOTE COMx [<baud-rate>]
```

For more information about the SIREMOTE command, refer to the section “SIREMOTE Utility” in Chapter 9, “Remote Debugging with SoftICE,” in the *Using SoftICE* document.

Examples

The following commands set up SoftICE on a target machine whose IP address is 10.0.0.5, and allows a remote machine whose IP address is 10.0.0.10 to connect to the target machine and control SoftICE.

```
NET START 10.0.0.5
NET ALLOW 10.0.0.10
```

Since the NET ALLOW command does not include the AUTO option, the remote user will only be allowed to connect to the target once.

The following commands set up SoftICE on a target machine that gets its IP address from a DHCP server. It then allows any other machine to connect if the user has the right password.

```
NET START DHCP
NET ALLOW ANY AUTO PASSWORD=NuMega
```

This NET ALLOW command specifies that any IP address can be used to connect to the target machine if the user provides the proper password.

The AUTO option tells SoftICE to allow remote machines to connect more than once in case of disconnect.

See Also

For more information on remote debugging, see Chapters 9 and 10 in *Using SoftICE.*

NTCALL

OS

Windows NT family

Type

System Information

Definition

Display NTOSKRNL calls used by NTDLL.

Syntax

NTCALL

Use

The NTCALL command displays all NTOSKRNL calls that are used by NTDLL. Many of the API's in NTDLL are nothing more than a wrapper for routines in NTOSKRNL, where the real work is done at level 0. If you use SoftICE to step through one of these calls, you will see that it immediately performs an INT 2Eh instruction. The INT 2Eh instructions serve as the interface for transitions between a privilege level 3 API and a privilege level 0 routine that actually implements the call.

When an INT 2Eh is executed, the EDX register is set to point at the parameter stack frame for the API and the EAX register is set to the index number of the function. When the current instruction pointer reference is an INT 2Eh instruction, the SoftICE disassembler will show the address of the privilege level 0 routine that will be called when the INT 2Eh executes, along with the number of dword parameters that are being passed in the stack frame pointed to by EDX. If you wish to see the symbol name of the routine, you must load symbols for NTOSKRNL and make sure that it is the current symbol table. Refer to *TABLE* on page 292.

Output

The NTCALL command display all the level 0 API's available. For each API, the following information displays:

Func.	Hexadecimal index number of the function passed in EAX.
Address	Selector:offset address of the start of the function.
Params	Number of dword parameters passed to the function.

Name Either the symbolic name of the function, or the offset within NTOSKRNL if no symbols are loaded.

The following example shows the disassembler output. Note how SoftICE indicates that the INT 2Eh instruction's execution result in the NTOSKRNL function, _NTSetEvent being called with 2 dword parameters.

```
ntdll!NtSetEvent
001B:77F8918C  MOV    EAX,00000095
001B:77F89191  LEA    EDX,[ESP+04]
001B:77F89195  INT    2E ; _NtSetEvent(params=02)
001B:77F89197  RET    0008
```

Example

The following example shows abbreviated output of the NTCALL command. It can be seen from this listing that the NTOSKRNL routine, _NTAccessCheck, is located at 8:80182B9Eh, that it is assigned a function identifier of 1, and that it takes 8 dword parameters.

```
NTCALL

00      0008:80160D42   params=06   _NtAcceptConnectPort
01      0008:80182B9E   params=08   _NtAccessCheck
02      0008:80184234   params=0B   _NtAccessCheckAndAuditAlar
                                    m
03      0008:80180C0A   params=06   _NtAdjustGroupsToken
04      0008:80180868   params=06   _NtAdjustPrivilegesToken
05      0008:8017F9A6   params=02   _NtAlertResumeThread
06      0008:8017F95E   params=01   _NtAlertThread
07      0008:8014B0C4   params=01   _NtAllocateLocallyUniqueId
08      0008:8014B39A   params=03   _NtAllocateUuids
```

NTSTATUS

OS

Windows NT family

Type

System Information

Definition

Display header-defined mnemonics for NTSTATUS error codes.

Syntax

NTSTATUS *code*

Use

The NTSTATUS command displays the header-defined mnemonic associated with a specific NTSTATUS code. Many APIs in the operating system (especially the DDK) return NTSTATUS standard error codes. This command allows you to return the more intuitive mnemonic associated with any NTSTATUS error code.

Example

The following example shows the NTSTATUS command returning the mnemonic for the error code `0x5e`:

```
NTSTATUS 0x5e
OBJECT_INITIALIZATION_FAILED
```

O

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

I/O Port

Definition

Output a value to an I/O port.

Syntax

O[*size*] ***port value***

size

Value	Description
B	Byte
W	Word
D	Dword

port	Port address.
value	Byte, word, or dword value as specified by size.

Use

Output to PORT commands are used to write a value to a hardware port. Output can be done to byte, word, or dword ports. If no size is specified, the default is B.

All outputs are sent immediately to the hardware with the exception of the interrupt mask registers (Port 21h & A1h). These do not take effect until the next time you exit from the SoftICE screen.

Example

The following command performs an out to port 21, which unmasks all interrupts for interrupt controller one.

```
O 21 0
```

OBJDIR

OS

Windows 98, Windows Me, and the Windows NT family

Type

System Information

Definition

Display objects in a Windows 98, Me, or NT/2000 Object Manager's object directory.

Syntax

OBJDIR [***object-directory-name***]

object-directory-name	Name of the object as it appears in the Object Manager's object directory.

Use

Use the OBJDIR command to display the named objects within the Object Manager's object directory. Using OBJDIR with no parameters displays the named objects within the root object directory. To list the objects in a subdirectory, enter the full object directory path.

Output

The following information will be displayed by the OBJDIR command:

Object	Address of the object body.
ObjHdr	Address of the object header.
Name	Name of the object.
Type	Windows-defined data type of the object.

Example

The following example is abbreviated output of OBJDIR listing objects in the Device object directory.

```
OBJDIR device

Directory of \Device at FD8E7F30
Object        ObjHdr        Name                 Type
FD8CC750      FD8CC728      Beep                 Device
FD89A030      FD89A008      NwlnkIpx             Device
FD889150      FD889128      Netbios              Device
FD8979F0      FD8979C8      Ip                   Device
FD8C9ED0      FD8C9EA8      KeyboardClass0       Device
FD8C5038      FD8C5010      Video0               Device
FD8C4040      FD8C4018      Video1               Device
```

In the following example, the OBJDIR command is used with a specified object directory pathname to list the objects in the \Device\Harddisk0 subdirectory.

```
OBJDIR \device\harddisk0

Directory of \Device\Harddisk0 at FD8D38D0
Object         ObjHdr         Name             Type
FD8D3730       FD8D3708       Partition0       Device
FD8D3410       FD8D33E8       Partition1       Device
FD8D32D0       FD8D32A8       Partition2       Device
3 Object(s)
```

See Also

OBJTAB

OBJTAB

OS

Windows NT family

Type

System Information

Definition

Display entries in the WIN32 user object-handle table.

Syntax

OBJTAB [***handle*** | ***object-type-name*** | **-h**]

handle	Object handle.
object-type-name	One of the object-type-names, predefined by SoftICE:

FREE	Free handle
HWND	Hwnd
Menu	Menu or Sub-menu object
Icon (or Crsr)	HICON or HCURSOR
DFRW	DeferWindowPos data
HOOK	Hook
TINF	Thread Info data
QUE (3.51 only)	Message queue
CPD	Call Proc Data thunk
ACCL	Accelerator table
WSTN	Workstation object
DESK(3.51 only)	Desktop object
DDE	DDE String

-h	Display list of valid object-type-names.

Use

Use the OBJTAB command to display all entries in the master object-handle table created and maintained by CSRSS, or to obtain information about a specific object or objects of a certain type. The master object-handle table contains information for translating user object-handles such as an hWnd or hCursor into the actual data that represents the object.

If you use OBJTAB without parameters, SoftICE lists the full contents of the master object-handle table. If an object handle is specified, just that object is listed. If an object-type-name is entered, all objects in the master object-handle table of that type are listed.

Output

The following information is displayed by the OBJTAB command:

Object	Pointer to the object's data.
Type	Type of the object.
Id	Object's type ID.
Handle	Win32 handle value for the object.
Owner	CSRSS specific instance data for the process or thread that owns the object.
Flags	Object's flags.

Example

The following is an abbreviated example using the OBJTAB command without parameters or options.

```
OBJTAB

Object      Type            Id          Handle      Owner       Flags
7F2D4DA0    Hwnd            01          0004005C    7F2D5F88    00
7F2D85B8    Menu            02          0001005D    00298B40    00
7F2D4E58    Hwnd            01          0003005E    7F2D5F88    00
7F2D1820    Queue           07          0002005F    00000000    00
003E50E0    Accel. Table    09          00030060    00298B40    00
```

See Also

OBJDIR

OPINFO

OS

Windows NT family

Type

Miscellaneous

Definition

Display information about an assembly-language instruction.

Syntax

OPINFO *asm-instruction*

asm-instruction	Assembly-language instruction.

Use

The OPINFO command displays a brief description of an assembly-language instruction. For general-purpose instructions, this command will also display a list of the affected flags in the EFFLAGS register. OPINFO supports all x86 instructions, including SSE, SSE2, and AMD 3DNow! instructions. The x87 floating-point instructions are not supported.

The list of affected EFLAGS are shown as a table with an entry fo each flag in the low 16-bits of EFLAGS. The possible values for each flag are:

Value	Meaning
T	Instruction tests flag
M	Instruction modifies flag
O	Instruction resets flag
1	Instruction sets flag
-	Instruction effect on flag undefined
R	Instruction restores prior value of flag
Blank	Instruction does not affect flag

Example

The following example shows the OPINFO command used to display information about the ADC assembly-language instruction.

```
OPINFO adc
ADC
     Integer addition: DEST <- DEST + SRC
     EFLAGS| OF DF IF SF ZF AF PF CF TF NT RF |
           | M        M  M  M  M  TM          |
```

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Key

F10 (P RET: F12)

Definition

Execute one program step.

Syntax

P [**RET**]

RET	Return. Step until a return or return from interrupt instruction is found.

Use

The P command executes a logical program step. In assembly mode, one instruction at the current CS:EIP is executed unless the instruction is a call, interrupt, loop, or repeated string instruction. In those cases, the entire routine or iteration is completed before control is returned to SoftICE.

If RET is specified, SoftICE will step until it finds a return or return from interrupt instruction. This function works in either 16- or 32-bit code and also works in level 0 code.

The P command uses the single step flag for most instructions. For call, interrupt, loop, or repeated string instructions, the P command uses a one-time INT 3 instruction execution breakpoint.

In source mode one source statement is executed. If the source statement involves calling another procedure, the call is not followed. The called procedure is treated like a single statement.

If the Register window is visible when SoftICE pops up, all registers that have been altered since the P command was issued display with the bold video attribute. For call instructions, the highlighted registers show what registers a subroutine has not preserved.

In an unusually long procedure, there can be a noticeable delay when using the P RET command, because SoftICE is single-stepping every instruction.

For Windows 9x and the Windows NT family

The P command, by default, is thread specific. If the current EIP is executing in thread X, SoftICE will not break until the program step occurs in thread X. For Windows NT family platforms, this prevents the case of process switching or thread switching during the program step causing execution to stop in a different thread or process than the one you were debugging. To change this behavior, either use the SET command with the THREADP keyword or disable thread-specific stepping in the troubleshooting SoftICE initialization settings.

Example

The following example executes one program step.

```
P
```

PACKET

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display the contents of a network packet.

Syntax

```
PACKET [address]
PACKET [address] [length]
PACKET ETHERNET | TOKEN-RING | ARCNET | FDDI
PACKET LINE | DETAIL | STRUCTURE
PACKET RAW | STANDARD
PACKET VALIDATE | NOVALIDATE
PACKET HELP
```

address — Address of the network packet.

length — Length of the network packet.

ETHERNET | TOKEN-RING | ARCNET | FDDI — Specifies a packet type.

LINE | DETAIL | STRUCTURE — LINE displays one line per packet; DETAIL displays detailed information per packet; STRUCTURE produces a structured element dump.

RAW | STANDARD — RAW displays data in hexadecimal; STANDARD displays formatted/interpreted data.

VALIDATE | NOVALIDATE — VALIDATE turns “sanity checking” on; NOVALIDATE turns “sanity checking” off.

Use

Use the PACKET command to display the contents of a network packet.

Output

The output of the PACKET command varies depending on the options selected. See the example below.

Example

The following example shows the output of the PACKET command.

```
PACKET 85edf6e8
Ethernet:
DIX:
Destination: 00A0C98AB20A Size: 003C
Source: 00B0D02CEE87 Type: 0800
IP:
IP version: 4 IP header length: 5 (32-bit WORDs)
Type of service: 00
Precedence = Routine
Delay = Normal
Throughput = Normal
Reliability = Normal
Packet length: 003C Packet ID: 9BF5
More fragments: NO Fragment offset: 0000
Time-to-live: 128 Protocol: ICMP(1) Header checksum: 9CC9
(GOOD)
Source host id: 172.23.100.153
Destination host id: 192.80.49.1
ICMP:
Type = Echo(8)
Code = 0
Checksum = 5C0E
Identifier = 512
Sequence Number = 15616
ICMP Data:
========================== Start of
Text========================
abcdefghijklmnopqrstuvwabcdefghi
=========================== End of Text
========================
```

PAGE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display page table information.

Syntax

PAGE [***address*** [**L** ***length***]]

address	The virtual address, segment:offset address, or selector:offset address about which you want to know page table information. The output includes the virtual and physical address.
length	Number of pages to display.

Use

The PAGE command can be used to list the contents of the current page directory or the contents of individual page table entries.

Note: Multiple page directories are used only by the Windows NT family.

In the x86 architecture, a page directory contains 1024 4-byte entries, where an entry specifies the location and attributes of a page table that is used to map a range of memory related to the entry's position in the directory. (These ranges are shown on the far right in the PAGE command's output of the page directory.)

Each entry represents the location and attributes of a specific page within the memory range mapped by the page table. An x86 processor page is 4KB in size, so a page table maps 4MB of memory (4KB/page * 1024 entries), and the page directory maps up to 4GB of memory (4MB/page table * 1024 entries).

NT uses the 4 MB page feature of the Intel Pentium processors. NTOSKRNL, HAL, and all boot drivers are mapped into a 4 MB page starting at 2 GB (80000000h).

Note: In the above paragraph, we assume that the user space is 2 GB. That may not be the case; in some versions of NT Advanced Server and some Windows 2000/Windows XP products, the user space could be 3 GB.

When you specify the address parameter, information about the page table entry that maps the address is shown. This includes the following:

- The linear virtual address of the start of the page mapped by the entry.
- The physical address that corresponds to the start of the page mapped by the entry.
- The page table entry attributes of the page. This information corresponds directly to processor defined attributes. Page table attributes are represented by bits that indicate whether or not the entry is valid, whether the page is dirty or has been accessed, whether its a supervisor or user-mode page, and its access protections. Only bit attributes that are set are shown by SoftICE.
- The page type. This information is interpreted from the Windows-defined bit field in the page table entry and the types displayed by SoftICE correspond to Windows definitions.

Use the length parameter with the address parameter to list information about a range of consecutive page table entries. It should be noted that the PAGE command will not cross page table boundaries when listing a range. This means that, if fewer entries are listed than you specified, you must use a second PAGE command to list the pages starting where the first listing stopped.

If no parameters are specified, the PAGE command shows the contents of the current page directory. Each line listed represents 4MB of linear address space. The first line shows the physical and linear address of the page directory. Each following line displays the information in each page directory entry. The data shown for each entry is the same as is described above for individual page table entries, however, in this output addresses represent the locations of page tables rather than pages.

Output

The following information is displayed by the PAGE command:

physical address If a page directory is being displayed then this is the physical address of the page table that a page directory entry refers to. Each page directory entry references one page table which controls 4MB of memory.

If an address parameter is entered so that specific pages are displayed, then this is the physical address that corresponds to the start of a page.

linear address	For Windows 3.1 and Windows 9x only: If the page directory is being displayed then this is the virtual address of a page table. This is the address you would use in SoftICE to display the page table with the D command. If specific pages are being displayed, this is the virtual address of a page. If a length was entered then this is the virtual address of the start of each page.
attribute	This is the attribute of the page directory or page table entry. The valid attributes are, as follows:

Windows 3.1, Windows 9x, and the Windows NT family		Windows NT family only	
P	Present	*S*	Supervisor
D	Dirty	*RW*	Read/Write
A	Accessed	*4M*	4 MB page
U	User		
R	Read Only		
NP	Not Present		

type	For Windows 3.1 and Windows 9x only: Each page directory entry has a three-bit field that can be used by the operating system to classify page tables. Windows classifies page tables into the following six categories:

System	Private
Instance	Relock
VM	Hooked

If a page is marked **Not Present**, then all that is displayed is “NP” followed by the dword contents of the page table entry.

Example

For Windows 3.1 and Windows 9x

Using the PAGE command with no parameters displays page directory information. The following shows this PAGE command output.

```
PAGE


Page Directory Physical=002B6000 Linear=006B600

Physical  Linear    Attributes        Type     Linear Address
                                               Range
002B7000  006B7000  P            A  U  System   00000000-003FFFFF
00109000  00509000  P            A  U  System   00400000-007FFFFF
0010A000  0050A000  P               U  System   00800000-00BFFFFF
0010B000  0050B000  P               U  System   00C00000-00FFFFFF
0010C000  0050C000  P               U  System   01000000-013FFFFF
002B8000  006B8000  P            A  U  System   80000000-803FFFFF
00106000  00506000  P            A  U  System   80400000-807FFFFF
00107000  00507000  P               U  System   80800000-80BFFFFF
00108000  00508000  P               U  System   80C00000-80FFFFFF
002B7000  006B7000  P            A  U  System   81000000-813FFFFF
```

Using the PAGE command with the address parameter displays the page table entry that corresponds to the address you specify. In the following example, three page table entries are shown starting with the page table entry that corresponds to address 00106018. Notice that when the length parameter is specified, the linear address is truncated to the base address of the memory page that contains the specified address.

```
PAGE 00106018 l 3


Linear        Physical      Attributes            Type
00106000      00006000      P                U    VM
00107000      00007000      P                U    VM
00108000      00008000      P                U    VM
```

The following example shows how the PAGE command can be used to find both the virtual and physical address of selector:offset address.

```
PAGE #585:263C

Linear          Physical        Attributes              Type
0004A89C        00218442        P                U      Instance
```

For the Windows NT family

When the Page command displays information on either PTEs or PDEs for NT, 4 MB pages are indicated by the mnemonic “4M” in the Attributes column. The following sample output shows the region starting at 2 GB.

```
PAGE
Page Directory   Physical=00030000
Physical      Attributes     Linear Address Range
00000000      P   A S RW 4M   80000000 - 803FFFFF
00400000      P   A S RW 4M   80400000 - 807FFFFF
00800000      P   A S RW 4M   80800000 - 80BFFFFF
00C00000      P   A S RW 4M   80C00000 - 80FFFFFF
01034000      P   A S RW 4M   81000000 - 813FFFFF
```

The following example shows how to use the PAGE command to display the attributes and addresses of the page from which instructions are currently being executed.

```
PAGE eip
Linear     Physical    Attributes
80404292   00404292    P D A S RW
```

PAGEIN

OS

Windows 9x and the Windows NT family

Type

Category

Definition

Force a page of memory to be loaded into physical memory.

Caution: PAGEIN can be an unsafe command and is recommended for OS experts only. If the currently executing thread is not in a context in which it can touch pageable memory, issuing PAGEIN can crash your system. You should be sure you understand the state of your application and the effect of this command before attempting to use it.

Syntax

PAGEIN *address*

address	Linear address of the page to be loaded.

Use

In some cases, a SoftICE command cannot retrieve the data you request because the actual physical memory that backs a particular linear address has been paged out by the operating system and so is not present in memory. You can use the PAGEIN command to force the page to be brought in from disk memory into physical memory.

Example

The following example shows the use of the PAGEIN command to load a page into physical memory.

```
PAGEIN 401000
```

See Also

PAGE

PAUSE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Pause after each screen.

Syntax

PAUSE [**on** | **off**]

Use

The PAUSE command controls screen pause at the end of each page. If PAUSE is on, you are prompted to press any key before information scrolls off the Command window. The Enter key scrolls a single line at a time. Any other key scrolls a page at a time. The prompt displays in the status line at the bottom of the Command window.

If PAUSE if off, the information automatically scrolls to the end of the command output.

If you do not specify a parameter, the current state of PAUSE displays.

The default is PAUSE on.

Example

The following command specifies that the subsequent Command window display will not automatically scroll off the screen. You are prompted to press a key before information scrolls off the screen.

```
PAUSE on
```

See Also

SET

PCI

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Dump the configuration registers for each PCI device in the system.

Syntax

```
PCI [-terse | [-raw] [-extended] [-b | -w | -d]]
 [bus device function]
```

-terse	Dumps terse information that includes bus, device, and function information as well as device and vendor IDs.
-raw	Dumps the first 0x40 bytes of each function's PCI space.
-extended	Dumps all 256 bytes of each function's PCI space.
-b | *-w* | *-d*	Information is dumped in byte | word | doubleword format.
bus	Bus number.
device	Device number.
function	Function number.

Use

The PCI command dumps the registers for each PCI device in the system. Do not use this command on non-PCI systems. Many of the entries are self-explanatory, but some are not. Consult the PCI specification for more information about this output.

Example

The following examples illustrate a part of the output for the PCI command.

```
PCI -terse
00/00/00 8086-7124 INTEL CORP
00/01/00 8086-7125 INTEL CORP
00/1E/00 8086-2418 INTEL CORP
00/1F/00 8086-2410 INTEL CORP
00/1F/01 8086-2411 INTEL CORP
00/1F/02 8086-2412 INTEL CORP
00/1F/03 8086-2413 INTEL CORP
01/07/00 1274-1371 ENSONIQ AudioPCI
01/0C/00 10B7-9200 3COM CORP 3Com EtherLink 10/100 PCI
 NIC (3C905C-TX)
```

```
PCI -extended 0 1f 0
Bus 00 Device 1F Function 00
Vendor: 8086 INTEL CORP
Device: 2410
Revision: 02
Device class: 06 Bridge device
Device subclass: 01 ISA bridge
Device sub-subclass: 00
Interrupt line: 00 Interrupt pin: 00 Min_Gnt: 00 MaxLat: 00
Cache line size: 00 Latency timer: 00 Header type: 80 BIST:
00
I/O:1 Mem:1 BusMast:1 Special:1 MemInv:0
Parity:0 Wait:0 SERR:0 Back2Back:0 Snoop:0


40: 00000801 00000010 00000000 00000000
50: 00000000 00000000 00000881 00000010
60: 09098A09 00000090 00000000 00000000
90: 0000FCFF 00000000 00000000 00000000
A0: 00000220 00000000 00000000 00000000
C0: 00000000 00000804 00000000 00000001
D0: 00002006 00000F02 00000000 00000000
E0: C0000010 140F0C01 00112233 00000771
F0: 00600000 00000000 00000F3A 00000000
```

PEEK

OS

Windows 9x and the Windows NT family

Type

Display/Change Memory

Definition

Read from physical memory.

Syntax

`PEEK`*`[size] address`*

size	B (byte), W (word), or D (dword). Size defaults to B.
address	Physical memory address.

Use

PEEK displays the byte, word, or dword at a given physical memory location. PEEK is useful for reading memory-mapped I/O registers.

Example

The following example displays the dword at physical address FF000000.

```
PEEKD FF000000
```

See Also

PAGE; PHYS; POKE

PHYS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display all virtual addresses that correspond to a physical address.

Syntax

PHYS ***physical-address***

physical-address	Memory address that the x86 generates after a virtual address has been translated by its paging unit. It is the address that appears on the computer's BUS, and is important when dealing with memory-mapped hardware devices such as video memory.

Use

Windows uses x86 virtual addressing support to define a relationship between virtual addresses, used by all system and user code, and physical addresses that are used by the underlying hardware. In many cases a physical address range may appear in more than one page table entry, and therefore more than one virtual address range.

SoftICE does not accept physical addresses in expressions. To view the contents of physical memory you must use the PHYS command to obtain linear addresses that can be used in expressions.

For Windows 9x and the Windows NT family

The PHYS command is specific to the current address context. It searches the Page Tables and Page Directory associated with the current SoftICE address context.

Example

Physical address A0000h is the start of VGA video memory. Video memory often shows up in multiple virtual address in Windows. The following example shows three different virtual addresses that correspond to physical A0000.

```
PHYS a0000

000A0000
004A0000
80CA0000
```

POKE

OS

Windows 9x and the Windows NT family

Type

Display/Change Memory

Definition

Write to physical memory.

Syntax

POKE*[size] address value*

size	B (byte), W (word), or D (dword). Size defaults to B.
address	Physical memory address.
value	Value to write to memory.

Use

POKE writes a byte, word, or dword value to a given physical memory location. POKE is useful for writing to memory-mapped I/O registers.

Example

The following example writes the dword value 0x12345678 to physical address FF000000.

```
POKED FF000000 12345678
```

See Also

PAGE; PEEK; PHYS

Print Screen Key

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Print contents of screen.

Syntax

PRINT SCREEN key

Use

Pressing PRINT SCREEN dumps all the information from the SoftICE screen to your printer. By default, the printer port is LPT1. Use the PRN command to change your printer port. Since SoftICE accesses the hardware directly for all of its I/O, Print Screen works only on printers connected directly to a COM or LPT port. It does not work on network printers.

If you do not want to dump the information directly to a printer, you can save the SoftICE history buffer to a file. In the SoftICE Symbol Loader, choose SAVE SOFTICE HISTORY AS . . . from the File menu. For more information, see *Using SoftICE*.

For Windows 9x and the Windows NT family

From a DOS VM, use the DLOG.EXE utility to log the SoftICE Command window information.

See Also

PRN

PRN

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Customization

Definition

Set printer output port.

Syntax

PRN [**lpt*x*** | **com*x***]

x	Decimal number between 1 and 2 for LPT, or between 1 and 4 for COM .

Use

The PRN command allows you to send output from Print Screen to a different printer port. If no parameters are supplied, PRN displays the currently assigned printer port.

Example

The following command causes Print Screen output to go to the COM1 port.

```
PRN com1
```

PROC

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display summary information about any or all processes in the system.

Syntax

For Windows 9x

PROC [**-xo**] [***task***]

For the Windows NT family

PROC [[**-xom**] ***process-type*** | ***thread-type***]

-x	Display extended information for each thread.
-o	Display list of objects in processes handle table.
-m	Display information about the memory usage of a process.
task	Task name.
process-type	Process handle, process ID, or process name.
thread-type	Thread handle or thread ID.

Use

If you use the PROC command without any options, summary information is presented for the process you specify or, if none is specified, for all processes in the system. The information the memory option (-m) provides is also included when you specify the extended option (-x) for the Windows NT family. The memory information is provided for convenience, because the amount of extended information displayed is quite large.

For all process and thread times, as well as process memory information, SoftICE uses raw values from within the OS data structures without performing calculations to convert them into standardized units.

The object option (-o) displays the object pointer, the object handle, and the object type for every object in the processes object handle table. Since object information is allocated from the system's pageable pool, the object's type name will not be available if the page is not present. In this case, question marks (???) are displayed.

Output

For Windows 9x

For each process the following summary information is provided:

Process	Task name.
pProcess	Pointer to process database (pdb).
Process ID	The Ring 3 ID of the process.
Threads	Number of threads the process owns.
Context	Address context.
DefHeap	Default heap.
DebuggeeCB	Debuggee context block.

For the Windows NT family

For each process the following summary information is provided:

Process	Process name.
KPEB	Address of the Kernel Process Environment Block.
PID	Process ID.
Threads	Number of threads the process owns.
Priority	Base priority of the process .
User Time	Relative amount of time the process spent executing code at user level.
Krnl Time	Relative amount of time the process spent executing code at the kernel level.
Status	Current status of the process:

- Running: The process is currently running.
- Ready: The process is in a ready to run state.
- Idle: The process is inactive.
- Swapped: The process is inactive, and its address space has been deleted.

- Transition: The process is currently between states.
- Terminating: The process is terminating.

Example

For Windows 9x

The following example lists all the processes in the system.

```
PROC

Process   pProcess ProcessID Threads   Context  DefHeap  DebuggeeCB
Winword   8156ACA8 FFFC8817  00000001 C10474D4 00400000 00000000
Gdidemo   81569F04 FFFCBBBB  00000001 C1033E38 00410000 00000000
Loader32  8156630C FFFC47B3  00000001 C10476D0 00470000 00000000
Explorer  815614C0 FFFC307F  00000002 C104577C 00440000 00000000
Mprexe    8155DFA4 FFFFFB1B  00000002 C1043340 00510000 00000000
MSGSRV32  8155D018 FFFFF4A7  00000001 C1041E28 00400000 00000000
KERNEL32  8165A31C FFFCF87A3 00000004 C10D9EDC 00640000 00000000
```

The following example shows extended information for GDIDEMO.

```
PROC -x gdidemo

Process Information for Gdidemo at 81569F04
Type:         00000005 RefCount:     00000002 Unknown1:     00000000
pEvent:       81569FC8 TermStatus:   00000103 Unknown2:     00000000
DefaultHeap:  00410000 MemContext:   C1033E38
Flags:        00000000
pPSP:         0001A1A0 PSPSelector:  26E7     MTEIndex:     0019
Threads:      0001     ThrNotTerm:   0001     Unknown3:     00000000
R0threads:    0001     HeapHandle:   8155B000 K16TDB:       2816
MMFViews:     00000000 pEDB:         8156A448 pHandleTable  8156A2C0
                                              :
ParentPDB:    8156630C MODREFlist:   8156ABB0 Threadlist:   81569FE8
DebuggeeCB:   00000000 LHFreeHead:   00000000 InitialR0ID:  00000000
&crtLoadLock  81569F64 pConsole:     00000000 Unknown4:     C007757C
:
ProcDWORD0:   00003734 ProcGroup:    8156630C ParentMODREF  8156ABB0
                                              :
```

TopExFilter:	00000000	PriorityBase:	00000008	Heapownlist:	00650000
HHandleBlks:	0051000C	Unknown5:	00000000	pConProvider:	00000000
wEnvSel:	19B7	wErrorMode:	0000	pEvtLdFinish	8156A2A0
UTState:	0000				

Environment Database

Environment:	00520020	Unknown1:	00000000		
CommandLine:	8156A500	C:\PROJECTS\GDIDEMO\Gdidemo.exe			
CurrentDir:	8156A524	C:\PROJECTS\GDIDEMO			
StartupInfo:	8156A53C	hStdIn:	FFFFFFFF	hStdOut:	FFFFFFFF
hStdError:	FFFFFFFF	Unknown2:	00000001	InheritCon	00000000
BreakType:	00000000	BreakSem:	00000000	BreakEvent:	00000000
BreakThreadId:	00000000	BrkHandlers:	00000000		

The following example shows a partial listing of the objects in Kernel32.

```
PROC -o kernel32

Handle      Object        Type
1           8165A32C      Process
2           8155BFFC      Event
3           C103E3A4      Memory Mapped file
4           C0FFE0E0      Memory Mapped file
5           C0FFE22C      Memory Mapped file
6           C0FF1058      Memory Mapped file
7           8155C01C      Event
8           8155CCE4      Event
9           8155CD5C      Event
A           8155CD8C      Thread
B           8155D008      Event
C           C1041C04      Memory Mapped file
D           8155D870      Event
```

For the Windows NT family

The following example uses the PROC command without parameters to list all the processes in the system.

```
PROC

Process  KPEB     PID   Threads Pri  User     Krnl     Status
                                     Time     Time
System   FD8E0020 2     14      8    00000000 00001A48 Ready
smss     FD8B9020 13    6       B    00000022 00000022 Swapped
csrss    FD8B3DC0 1F    12      D    00B416C5 00049C4E Ready
winlogon FD8AD020 19    2       D    00000028 00000072 Idle
services FD8A6880 28    B       9    0000018E 0000055A Idle
lsass    FD8A4020 2A    C       9    0000001B 00000058 Idle
spoolss  FD87ACA0 43    6       8    000000AB 000000BD Idle
nddeagnt FD872780 4A    1       8    00000004 0000000C Idle
*ntvdm   FD86DDC0 50    6       9    00125B98 0003C0BE Running
scm      FD85B300 5D    3       8    00000024 0000008A Idle
Explorer FD850020 60    3       D    000002DE 00000447 Ready
Idle     8016A9E0 0     1       0    00000000 00135D03 Ready
```

Note: The process that was active when SoftICE popped up will be highlighted. The currently active process/address context within SoftICE will be indicated by an asterisk (*).

The following example uses the extended option (-x) to display extended information about a specific process, Explorer.

```
PROC -x explorer

Extended Process Information for Explorer(60)

KPEB: FD850020 PID: 60 Parent: Unknown(48)
Base Pri: D Mem Pri: 0 Quantum: 2
Usage Cnt: 1 Win Ver: 4.00 Err. Mode: 0
Status: Ready

Processor: 00000000 Affinity: 1
Page Directory: 011CA000 LDT Base: 00000000 LDT Limit: 0000

Kernel Time: 00000447 User Time: 000002DE
Create Time: 01BB10646E2DBE90
Exit Time: 0000000000000000

Vad Root: FD842E28 MRU Vad: FD842E28 Empty Vad: FD823D08
DebugPort: 00000000 ExceptPort: E118B040 SE token: E1240450
SpinLock: 00000000 HUPEB: 00000004 UPEB: 7FFDF000

ForkInProgress: FALSE Thread: 00000000(0)
Process Lock: 00000001 Owner: 00000000(0)
Copy Mem Lock: 00000000 Owner: 00000000(0)

Locked Pages: 00000000 ProtoPTEs: 000000DD Modified Pages:
000000E4
Private Pages: 0000014F Virt Size: 013F8000 Peak Virt Size:
01894000

---- Working Set Information ----

Update Time: 01BB11D0D7B299C0
Data: C0502000 Table: C0502470
Pages: 00000879 Faults: 00000899 Peak Size: 00000374
Size: 000002AF Minimum: 00000032 Maximum: 00000159

---- Non Pageable Pool Statistics ----

Quota Usage: 00000E78 Peak Usage: 00001238
Inherited Usage: 0000C093 Peak Usage: 00056555 Limit: 00080000

---- Pageable Pool Statistics ----

Quota Usage: 00003127 Peak Usage: 00004195
Inherited Usage: 0000C000 Peak Usage: 00004768 Limit: 000009CA

---- Pagefile Statistics ----

Quota Usage: 00000151 Peak Usage: 0000016E
Inherited Usage: FFFFFFFF Peak Usage: 00000151 Limit: 00000000

---- Handle Table Information ----

Handle Table: E10CE5E8 Handle Array: E1265D48 Entries: 50
```

QUERY

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display the virtual address map of a process.

Syntax

QUERY [[-***x***] ***address***] | [***process-type***]

-x	Shows the mapping for a specific linear address within every context where it is valid.
address	Linear address to query.
process-type	Expression that can be interpreted as a process.

Use

The QUERY command displays a map of the virtual address space for a single process, or the mapping for a specific linear address. If no parameter is specified, QUERY displays the map of the current process. If a process parameter is specified, QUERY displays information about each address range in the process.

Output

For Windows 9x

Under Windows 9x, the QUERY command displays the following information:

Base	Pointer to the base address of the region of pages.
AllocBase	Pointer to the base address of a range of pages allocated by the VirtualAlloc function that contains the base address in the Base column.
AllocProtect	Access protection assigned when the region was initially allocated.

Size	Size, in bytes, of the region starting at the base address in which all pages have the same attributes.
State	State of the pages in the region: **Commit** - Committed pages for which physical storage was allocated. **Free** - Free pages not accessible to the calling process and available to be allocated. AllocBase, AllocProtect, Protect, and Owner are undefined. **Reserve** - Reserved pages. A range of the process's virtual address space is reserved, but physical storage is not allocated. Current Access Protection (Protect) is undefined.
Protect	Current Access protection.
Owner	Owner of the region.
Context	Address context.

For the Windows NT family

The QUERY command displays the following information:

Context	Address context.
Address Range	Start and end address of the linear range.
Flags	Flags from the node structure.
MMCI	Pointer to the memory management structure.
PTE	Structure that contains the ProtoPTEs for the address range.
Name	Additional information about the range. This includes the following:

- Memory-mapped files that will show the name of the mapped file.
- Executable modules that will show the file name of the DLL or EXE.
- Stacks that will be displayed as TID (thread ID).
- Thread information blocks that will be displayed as TID.
- Any address that the WHAT command can identify.

Example

Windows 9x

The following example shows a partial listing of the output of the QUERY command with no parameters. In this case, it displays the map for the current process, GDIDEMO.

```
QUERY

Base    AllocBase  AllocProt  Size    State    Protect  Owner
0       0          0          400000  Free     NA
400000  400000     1          7000    Commit   RO       GDIDEMO
407000  400000     1          2000    Commit   RW       GDIDEMO
409000  400000     1          2000    Commit   RO       GDIDEMO
40B000  400000     1          5000    Reserve  NA       GDIDEMO
410000  410000     1          1000    Commit   RW       Heap 32
411000  410000     1          FF000   Reserve  NA       Heap 32
510000  410000     1          1000    Commit   RW       Heap 32
511000  410000     1          F000    Reserve  NA       Heap 32
520000  520000     4          1000    Commit   RW
521000  520000     4          F000    Reserve  NA
```

The following example shows every context where base address 416000 is valid:

```
QUERY -x 416000

Base    AllocBase AllocProt Size   State   Protect Owner    Context
416000  400000    1         F1000  Reserve NA               KERNEL32
416000  400000    1         E9000  Reserve NA      Heap 32  MSGSRV32
416000  400000    1         D000   Commit  RO      EXPLORER Explorer
416000  410000    1         F9000  Reserve NA      Heap 32  WINFILE
416000  400000    1         2000   Commit  RO      CONSOLE  Console
416000  400000    1         E9000  Reserve NA      Heap 32  WINOLDAP
416000  410000    0         EA000  Free    NA               Mprexe
416000  410000    1         FA000  Reserve NA      Heap 32  Spool32
```

The following example shows a partial listing of the virtual address map for Explorer.

```
QUERY explorer

Base    AllocBase  AllocProt  Size    State    Protect  Owner
0       0          0          400000  Free     NA
400000  400000     1          23000   Commit   RO       EXPLORER
```

423000	400000	1	1000	Commit	RW	EXPLORER
424000	400000	1	11000	Commit	RO	EXPLORER
435000	400000	1	B000	Reserve	NA	EXPLORER
440000	440000	1	9000	Commit	RW	Heap32
449000	440000	1	F7000	Reserve	NA	Heap32
540000	440000	1	1000	Commit	RW	Heap32
541000	440000	1	F000	Reserve	NA	Heap32
550000	550000	4	1000	Commit	RW	
551000	550000	4	F000	Reserve	NA	
560000	560000	1	106000	Reserve	NA	

Windows NT family

The following example uses the QUERY command to map a specific linear address for the Windows NT family.

QUERY 7f2d0123

Context	Address Range	Flags	MMCI	PTE	Name
csrss	7F2D0000- 7F5CFFFF	0600000 0	FD8AC128	E1191068	Heap #07

The following example uses the QUERY command to list the address map of the PROGMAN process for the Windows NT family.

```
QUERY progman
Address Range      Flags     MMCI      PTE       Name
00010000-00010FFF  C4000001
00020000-00020FFF  C4000001
00030000-0012FFFF  84000004                      STACK(6E)
00130000-00130FFF  C4000001
00140000-0023FFFF  8400002D                      Heap #01
00240000-0024FFFF  04000000  FF0960C8  E1249948  Heap #02
00250000-00258FFF  01800000  FF0E8088  E11B9068  unicode.nls
00260000-0026DFFF  01800000  FF0E7F68  E11BBD88  locale.nls
00270000-002B0FFF  01800000  FF0E7C68  E11B6688  sortkey.nls
002C0000-002C0FFF  01800000  FF0E7AE8  E11BBA08  sorttbls.nls
002D0000-002DFFFF  04000000  FF09F3C8  E1249E88
002E0000-0035FFFF  84000001
00360000-00360FFF  C4000001
00370000-0046FFFF  84000003                      STACK(2E)
00470000-0047FFFF  04000000  FF0DF4E8  E124AAA8
00480000-00481FFF  01800000  FF0E7DE8  E110C6E8  ctype.nls
01A00000-01A30FFF  07300005  FF097AC8  E1246448  progman.exe
77DE0000-77DEFFFF  07300003  FF0FC008  E1108928  shell32.dll
77E20000-77E4BFFF  07300007  FF0FBA08  E1110A08  advapi32.dll
77E50000-77E54FFF  07300002  FF0FADC8  E1103EE8  rpcltc1.dll
77E60000-77E9BFFF  07300003  FF0FB728  E1110C48  rpcrt4.dll
77EA0000-77ED7FFF  07300003  FF0FCE08  E11048C8  user32.dll
77EE0000-77F12FFF  07300002  FF0FD868  E110F608  gdi32.dll
77F20000-77F73FFF  07300003  FF0EE1A8  E110C768  kernel32.dll
77F80000-77FCDFFF  07300005  FF0FDB48  E1101068  ntdll.dll
7F2D0000-7F5CFFFF  03400000  FF0E2C08  E11C3068  Heap #05
7F5F0000-7F7EFFFF  03400000  FF0E8EA8  E11B77E8
7FF70000-7FFAFFFF  84000001
7FFB0000-7FFD3FFF  01600000  FF116288  E1000188  Ansi Code
Page
7FFDD000-7FFDDFFF  C4000001                      TIB(2E)
7FFDE000-7FFDEFFF  C4000001                      TIB(6E)
7FFDF000-7FFDFFFF  C4000001                      SubSystem
Process
```

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Display/Change Memory

Definition

Display or change the register values.

Syntax

For Windows 3.1

R [***register-name*** [[=]***value***]]

For Windows 9x and the Windows NT family

R [**-d** | ***register-name*** | ***register-name*** [=] ***value***]

register-name	Any of the following: AL, AH, AX, EAX, BL, BH, BX, EBX, CL, CH, CX, ECX, DL, DH, DX, EDX, DI, EDI, SI, ESI, BP, EBP, SP, ESP, IP, EIP, FL, DS, ES, SS, CS FS, GS.
value	If register-name is any name other than FL, the value is a hexadecimal value or an expression. If register-name is FL, the value is a series of one or more of the following flag symbols, each optionally preceded by a plus or minus sign: ◆ D (Direction flag) ◆ I (Interrupt flag) ◆ S (Sign flag) ◆ Z (Zero flag) ◆ A (Auxiliary carry flag) ◆ P (Parity flag) ◆ C (Carry flag)
-d	Displays the registers in the Command window.

Use

If no parameters are supplied, the cursor moves up to the Register window, and the registers can be edited in place. If the Register window is not currently visible, it is made visible. If register-name is supplied without a value, the cursor moves up to the Register window positioned at the beginning of the appropriate register field.

If both register-name and value are supplied, the specified register's contents are changed to the value.

To change a flag value, use FL as the register-name, followed by the symbols of the flag whose values you want to toggle. To turn a flag on, precede the flag symbol with a plus sign. To turn a flag off, precede the flag symbol with a minus sign. If neither a plus or negative sign is specified, the flag value will toggle from its current state. The flags can be listed in any order.

Example

The following example sets the AH register equal to 5.

```
R ah=5
```

The following example toggles the O, Z, and P flag values.

```
R fl=ozp
```

The following example moves the cursor into the Register window position under the first flag field.

```
R fl
```

The following example toggles the O flag value, turns on the A flag value, and turns off the C flag value.

```
R fl=o+a-c
```

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

F4

Definition

Restore the program screen.

Syntax

RS

Use

The RS command allows you to restore the program screen temporarily.

This feature is useful when debugging programs that update the screen frequently. Use the RS command to redisplay your program screen. To return to the SoftICE screen, press any key.

S

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Search memory for data.

Syntax

For Windows 3.1

S [***address*** **L** ***length data-list***]

For Windows 9x and the Windows NT family

S [**-acu**] [***address*** **L** ***length data-list***]

-a	Specifies “find all matches in search range” as opposed to “find the first match in the search range and stop.”
-c	Makes search case-insensitive.
-u	Searches for UNICODE string.
address	Starting address for search.
length	Length in bytes.
data-list	List of bytes or quoted strings separated by commas or spaces. A quoted string can be enclosed with single or double quotes.

Use

Memory is searched for a series of bytes or characters that matches the data-list. The search begins at the specified address and continues for the length specified. When a match is found, the memory at that address is displayed in the Data window, and the following message is displayed in the Command window.

```
PATTERN FOUND AT location
```

If the Data window is not visible, it is made visible.

To search for subsequent occurrences of the data-list, use the S command with no parameters. The search will continue from the address where the data-list was last found, until it finds another occurrence of data-list or the length is exhausted.

The S command ignores pages that are marked not present. This makes it possible to search large areas of address space using the flat data selector (Windows 3.1/Windows 9x: 30h, the Windows NT family: 10h).

Example

The following example searches for the string 'Hello' followed by the bytes 12h and 34h starting at offset ES:DI+10 for a *length* of ECX bytes.

```
S es:di+10 L ecx 'Hello',12,34
```

The following example searches the entire 4GB virtual address range for 'string'.

```
S 30:0 L ffffffff 'string'
```

SERIAL

OS

Windows 3.1, Windows 9x

Type

Customization

Definition

Redirect console to serial terminal.

Note: The SERIAL command has not been supported since DriverStudio™ 2.0. The functions of the SERIAL command are now provided through the NET command.

Syntax

SERIAL [on | VT100 | [*com-port*] [*baud-rate*] | off]

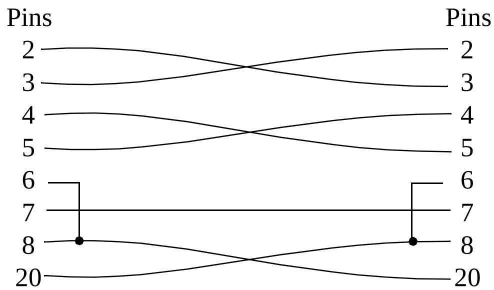
VT100	Initiates VT100 serial mode.
com-port	Number from 1 to 4 that corresponds to COM1, COM2, COM3 or COM4. Default is COM1.
baud-rate	Baud-rate to use for serial communications. The default is to have SoftICE automatically determine the fastest possible baud-rate that can be used. The rates are 1200, 2400, 4800, 9600, 19200, 23040, 28800, 38400, 57000, 115200.

Use

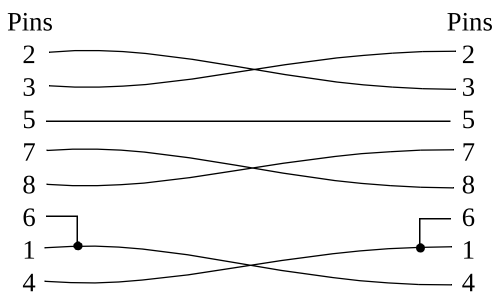
Use the SERIAL command to establish a remote debugging session through a serial port. Refer to *DIAL* on page 89 for information about how to establish remote sessions over a modem, and to Chapter 9, “Remote Debugging with SoftICE” in the *Using SoftICE* document for a detailed explanation of this procedure.

Remote debugging requires a second IBM-compatible PC. The machine being debugged is known as the local machine, and the machine where SoftICE is being controlled remotely is known as the remote machine.To use the SERIAL command, the remote and local machines must be connected with a null modem cable, with wiring as shown in the following figure, attached through serial ports. Before using the SERIAL command on the local machine, you must first run the SERIAL32.EXE or

SERIAL.EXE program on the remote machine. SERIAL32.EXE is a 32-bit client. SERIAL.EXE is a real mode (MSDOS) client.



25-Pin Null-Modem Configuration



9-Pin Null-Modem Configuration

The syntax for the SERIAL32.EXE and SERIAL.EXE programs are the same as the syntax of the SERIAL command, so the following information is applicable to all.

The SERIAL command has two optional parameters. The first parameter specifies the comport on the machine where the command is entered through which the connection will be made. If no comport is specified, Comport 1 (COM1) is chosen by default. The second parameter specifies a baud-rate. If a baud-rate is specified, the same baud-rate must be explicitly specified on both sides of the connection. If no baud-rate is specified, SoftICE will attempt to determine the fastest baud-rate that can be used over the connection without data loss. The process of arriving at the maximum rate can take a few seconds, during which SoftICE prints the rates it is checking. After the maximum rate is determined, SoftICE indicates the result.

Ctrl D is always the pop-up hot key sequence on the remote machine. SoftICE can also be popped up from the local machine with the local machine's pop-up hot key sequence (which may have been set via the ALTKEY command).

If the remote machine has a monochrome display, the COLOR command can be used to make SoftICE's output more readable.

If for any reason data is lost over the connection and SoftICE output on the remote machine becomes corrupted, Shift \ (backslash) can be typed on the remote machine to force a repaint of the SoftICE screen.

Specifying SERIAL OFF will end the remote debugging session and SoftICE will resume using the local machine for I/O. SERIAL with no parameters will display the current serial state and the com-port and baud-rate being used if SERIAL is ON.

Using Ctrl-Z will exit the SERIAL.EXE program on the remote machine after a remote debugging session is complete.

If you place the SERIAL command in the SoftICE initialization string setting, SERIAL.EXE must be running on the remote machine before SoftICE is started on the local machine.

For Windows 3.1

Prior to using the SERIAL command, you must place the COM*n* keyword on a separate line in the WINICE.DAT file to reserve a specific COM port for the serial connection. The *n* is a number between 1 and 4 representing the COM port. If this statement is not present in WINICE.DAT, SoftICE cannot be popped up from the remote machine. For example, the following keyword sets Com 2 as the serial post.

```
Com2
```

For Windows 9x

Select the desired comport in the remote debugging initialization settings within Symbol Loader.

Example

The following example shows how to run the SERIAL.EXE program on the remote machine:

```
SERIAL.EXE on 19200
```

The following example shows how to execute a SERIAL command on the local machine that corresponds to the SERIAL.EXE command given in the previous example.

```
SERIAL on 2 19200
```

When the first command is executed, the remote machine will be prepared to receive a connection request from the local machine on its first com-port at 19200bps. The second command establishes a connection between the two machines through the local machine’s second com-port. Since the first command explicitly specified a baud rate, the SERIAL command on the local machine must explicitly specify the same baud rate of 19200bps.

Once the connection is established, the remote machine will serve as the SoftICE interface for debugging the local machine until SERIAL OFF is entered on the remote machine.

See Also

Chapter 9, “Remote Debugging with SoftICE” in the *Using SoftICE* document.

SET

OS

Windows 9x and the Windows NT family

Type

Mode Control

Definition

Display or change the state of an internal variable.

Syntax

SET [***keyword***] [**on** | **off**] [***value***]

keyword	Specifies option to be set.
on, off	Enables or disables the option.
value	Value to be assigned to the option.

Use

Use the SET command to display or change the state of internal SoftICE variables.

If you specify SET with a keyword, ON or OFF enables or disables that option. If you specify SET with a keyword and value, it assigns the value to the keyword. If SET is followed by a keyword with no additional parameters, it displays the state of the keyword.

Using SET without parameters displays the state of all keywords.

SET supports the following keywords:

ALTSCR	[on|off|mono|vga]
ASSERT	[on|off]
BUTTONREVERSE	[on|off]
CASESENSITIVE	[on|off]
CENTER	[on|off]
CODE	[on|off]
EXCLUDE	[on|off]
FAULTS	[on|off]

FLASH	[on|off]
FONT	[1 | 2 | 3]
FORCEPALETTE	[on|off]
I1HERE	[on|off]
I3HERE	[on|off]
LONGTYPENAMES	[on|off]
LOWERCASE	[on|off]
MAXIMIZE	[on|off]
MONITOR	[1 | 2 | 3 | *n*] (Windows 2000/XP only)
MOUSE	[on|off] [1 | 2 | 3]
ORIGIN	x y (window location in pixel coordinates)
PAUSE	[on|off]
REFERENCE	[on|off]
SYMBOLS	[on|off]
TABS	[on|off] [1 | 2 | 3 | 4 | 5 | 6 | 7 | 8]
THREADP	[on|off]
TYPEFORMAT	[1 | 2 | 3]
VERBOSE	[on|off]
WHEELLINES	n

SET ASSERT OFF will prevent SoftICE from popping up on RtlAsserts. Text will still be displayed to the command window and can be viewed on the next popup. If **SET ASSERT ON** is selected, SoftICE will pop up on each RtlAssert.

SET BUTTONREVERSE ON reverses the meaning of the left and right mouse buttons.

SET CASESENSITIVE ON makes global and local symbol names case sensitive. Enter them exactly as displayed by the SYM command.

SET CENTER ON centers the SoftICE window. When you manually move the window, SoftICE turns centering off.

SET CODE ON will display the machine instruction bytes.

SET FAULTS OFF will prevent SoftICE from popping up on user mode faults.

SET FLASH ON will cause SoftICE to redraw its entire screen after every step and trace. Turn this on if you are debugging applications which render to the screen and overwrite the SoftICE display.

SET FONT n changes the font size when in Universal Display Mode. The font size is not alterable on VGA, remote debugging, or monochrome monitors.

SET FORCEPALETTE ON prevents the system colors (Palette Indices 0-7 and 248-255) from being changed in 8-bits per pixel mode. This ensures that the SoftICE display can always be seen. This is **OFF** by default.

SET I1HERE ON causes SoftICE to pop up on all instances of **Int 1**.

SET I3HERE ON causes SoftICE to pop up on all instances of **Int 3**. If the DRV option is given, only Int 3s that occur within the kernel space will cause SoftICE to pop up.

SET LONGTYPENAMES OFF turns off long typenames. When set to **ON**, "unsigned longs" will be shown as "ulong". All other types will be shortened accordingly.

SET LOWERCASE ON causes disassembly to be in lower case; if set to **OFF**, disassembly is in upper case.

SET MAXIMIZE ON sizes the UVD window as large as possible. This setting overrides LINES and WIDTH but not FONT. When you can change the LINES or WIDTH settings, SoftICE changes them only temporarily. The next time SoftICE pops up, it displays the window at maximum size.

On Windows 2000/XP only, **SET MONITOR** changes the monitor used to display SoftICE. Enter the decimal value representing the monitor you want to use to display SoftICE. Issuing the SET MONITOR command without parameters lists the monitors available to SoftICE. If you do not want SoftICE to patch in a specific video driver, add the base name of the DDI driver to the NTICE\ExcludedDisplayDrivers key in the registry. This list is delimited by semi-colons (**;**).

SET MOUSE ON enables mouse support and **SET MOUSE OFF** disables it. To adjust the speed at which the mouse moves, use one of the following: 1 (slowest speed); 2 (intermediate speed – this is the mouse default); 3 (fastest speed).

SET SYMBOLS ON instructs the disassembler to show the symbol names in disassembled code. **SET SYMBOLS OFF** instructs the disassembler to show numbers (for example, offsets and addresses). This command applies to both local and global symbol names.

SET TABS n changes the number of spaces to replace for each tab character.

SET THREADP OFF turns off thread-specific stepping within a process.

SET TYPEFORMAT N defines the layout and format of the locals window.

- SET TYPEFORMAT 1 is <type> <variable name> = <value>.
- SET TYPEFORMAT 2 is the default <variable name> <type> = <value>.
- SET TYPEFORMAT 3 is <variable name> = <value> <type>. There's also a winice.dat variable to control this. (TYPEFORMAT valid values are 1, 2, and 3.)

SET VERBOSE OFF turns off the SoftICE information messages such as LOAD32, UNLOAD32, and EXIT32.

SET WHEELLINES sets the number of lines that should be scrolled for each wheel movement when using an Intellipoint mouse.

Example

The following example enables SoftICE fault trapping:

```
SET faults on
```

The following example sets the mouse to the fastest speed:

```
SET mouse 3
```

See Also

ALTSCR; CODE; FAULTS; FLASH; I1HERE; I3HERE; THREADP

SHOW

OS

Windows 3.1, Windows 9x

Type

Symbol/Source

Key

Ctrl-F11

Definition

Display instructions from the back trace history buffer.

Syntax

SHOW [**B** | ***start***] [**l** ***length***]

B	Display instructions beginning with the oldest instruction.
start	Hexadecimal number specifying the index within the back trace history buffer to start disassembling from. An index of 1 corresponds to the newest instruction in the buffer.
length	Number of instructions to display.

Use

Use the SHOW command to display instructions from the back trace history buffer. If source is available for the instructions, the display is in mixed mode; otherwise, only code is displayed.

You can use the SHOW command only if the back trace history buffer contains instructions. To fill the back trace history buffer, use the BPR command with either the T or TW parameter to specify a range breakpoint.

The SHOW command displays all instructions and source in the Command window. Each instruction is preceded by its index within the back trace history buffer. The instruction whose index is 1 is the newest instruction in the buffer. Once SHOW is entered, you can use the Up and Down Arrow keys to scroll through the contents of the back trace history buffer. To exit from SHOW, press the Esc key.

SHOW with no parameters or SHOW B will begin displaying from the back trace history buffer starting with the oldest instruction in the buffer. SHOW followed by a start number begins displaying instructions starting at the specified index within the back trace history buffer.

Example

The following example starts displaying instructions in the Command window, starting at the oldest instruction in the back trace history buffer.

```
SHOW B
```

See Also

BPR

SRC

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Key

F3

Definition

Cycle among source, code, and mixed displays in the Code window.

Syntax

SRC

Use

Use the SRC command to cycle among the following modes in the Code window:

Tip: Use F3 to cycle modes quickly.

- Source Mode
- Code Mode
- Mixed Mode

Example

The following example changes the current mode of the Code window.

```
SRC
```

SS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Search the current source file for a string.

Syntax

SS [***line-number***] [***'string'***]

line-number	Decimal number.
string	Character string surrounded by quotes.

Use

The SS command searches the current source file for the specified character string. If there is a match, the line that contains the string is displayed as the top line in the Code window.

The search starts at the specified line-number. If no line-number is specified, the search starts at the top line displayed in the Code window.

If no parameters are specified, the search continues for the previously specified string.

The Code window must be visible and in source mode before using the SS command. To make the Code window visible, use the WC command. To make the Code window display source, use the SRC command.

Example

In the following example, the current source file is searched starting at line 1 for the string 'if (i==3)'. The line containing the next occurrence of the string becomes the top line displayed in the Code window.

```
SS 1 'if (i==3)'
```

STACK

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display a call stack.

Syntax

For Windows 3.1 and Windows 9x

STACK [**-v** | **-r**] [***task-name*** | ***SS:[E]BP***]

-v	Verbose. Displays local variables in 32-bit code.
-r	Ring transition. Walks through ring transitions in 32-bit code.
task-name	Name of the task as displayed by the TASK command.
SS:[E]BP	`SS:[E]BP` of a valid stack frame.

For the Windows NT family

STACK [**-v** | **-r**] [***thread-type*** | ***stack frame***]

thread-type	Thread handle or thread ID.
stack frame	Value that is not a thread-type is interpreted as a stack frame.

Use

Use the STACK command to display the call stacks for DOS programs, Windows tasks, and 32-bit code.

If you enter STACK with no parameters, the current `SS:[E]BP` is used as a base for the stack frame displayed. You can explicitly specify a stack base with a task-name or base address, and under the Windows NT family, with a thread identifier.

If you are using STACK to display the stack of a Windows task that is not the current one, specify either its task-name or a valid `SS:[E]BP` stack frame. You can use the TASK command to obtain a list of running tasks. However, you should avoid using the STACK command with the current task of the TASK command's output (marked with an '*'), because the task's last known `SS:[E]BP` is no longer valid.

The STACK command walks the stack starting at the base by traversing x86 stack frames. If an invalid stack frame or address that has been paged out is encountered during the walk, the traversal will stop. In 32-bit code, the -r (ring transition) switch tells SoftICE to continue walking the stack through ring transitions. The SoftICE stack walking algorithm can use FPO (frame pointer omission) data to walk call stacks. The FPO data is a type of debug information that is embedded in a .NMS file during the translation step. The FPO data is module/symbol table specific. Therefore, when using the STACK command, it will be helpful to have symbol tables for all modules that are listed on the stack. If SoftICE does not have FPO data, it is limited to walking EBP frames only.

The address of the call instruction at each frame is displayed along with the name of the routine it is in, if the routine is found in any loaded symbol table. If the routine is not in the symbol table, the export list and module name list are searched for nearby symbols.

In 32-bit code, the STACK command output includes the frame pointer, the return address, and the instruction pointer for each frame. If you set the -v switch, SoftICE also displays the local variables for each frame. For each frame in the call stack, both the nearest symbol to the call instruction, and the actual address, are displayed. If there is no symbol available, the module name and object/section name are displayed instead.

The 32-bit call stack support is not limited to applications; it will also work for VxDs and Windows NT family device driver code at ring 0. Since many VxDs are written in assembly language, there may not be a valid call stack to walk from a VxD-stack base address.

For Windows 3.1 and Windows 9x, the call stack is not followed through ring transitions, but under Windows NT/2000/XP, it is when you set the -r switch.

For Windows 3.1 and Windows 9x

If you want SoftICE to pop up when a non-active task is restarted, you can use the STACK command with the task as a parameter to find the address on which to set an execution breakpoint. To do this, enter STACK followed by the task-name. The bottom line of the call stack will show an address preceded by the word 'at'. This is the address of the CALL instruction the program made to Windows that has not yet returned. You must set an execution breakpoint at the address following this call.

You can also use this technique to stop at other routines higher on the call stack. This is useful when you do not want to single step through library code until execution resumes in your program's code.

Example

The following example shows the output from the STACK -r command when sitting at a breakpoint in the Driver::Works PCIENUM sample. Using the -r parameter results in the STACK command walking past the ring transition in _KiSystemService. The output is organized into three columns. Column one is the frame pointer. Column two is the return address. Column three is the instruction pointer.

```
STACK -r

FC070DE8 F74FC919    KIrp::KIrp+0007
FC070E04 F74FC796    KDevice::DeviceIrpDispatch+003C
FC070E18 801FE4F8    KDriver::DriverIrpDispatch+0026
FC070E30 8016EBF8    @IofCallDriver+0037
FC070E48 8016CDF7    _IopSynchronousServiceTail+006A
FC070ED8 8013DC14    _NtReadFile+0683
FC070F04 77F67E87    _KiSystemService+00C4
0012FE04 77F0D300    ntdll!.text+6E87
0012FE6C 100011A0    _ReadFile+01A6
0012FEDC 00401057    PCIDLL!.text+01A0
0012FF80 004017C9    PCIEXE!.text+0057
0012FFC0 77F1BA3C    PCIEXE!.text+07C9
0012FFF0 00000000    _BaseProcessStart+0040
```

The following example shows the same stack as the previous example, but displayed with the STACK -V -R command. The -v switch causes the local variables for each frame to be displayed.

```
STACK -v -r

F74AFDE8 F74FC919    KIrp::KIrp+0007
     [EBP-4] + const class KIrp * this = 0xF74AFDF4 <{...}>
     [EBP+8] +struct _IRP * pIrp = 0x84C460E8 <{...}>
F74AFE04 F74FC796    KDevice::DeviceIrpDispatch+003C
     [EBP-C] + const class KDevice * this = 0x807DC7A8 <{...}>
     [EBP-4]  unsigned long Major = 0x3
     [EBP+8] +struct _IRP * pIrp = 0x84C460E8 <{...}>
F74AFE18 801FE4F8    KDriver::DriverIrpDispatch+0026
     [EBP+8] +struct _DEVICE_OBJECT * pSysDev = 0x807DB850
<{...}>
     [EBP+C] +struct _IRP * pIrp = 0x84C460E8 <{...}>
F74AFE30 8016EBF8    @IofCallDriver+0037
F74AFE48 8016CDF7    _IopSynchronousServiceTail+006A
F74AFED8 8013DC14    _NtReadFile+0683
F74AFF04 77F67E87    _KiSystemService+00C4
0012FE04 77F0D300    ntdll!.text+6E87
0012FE6C 100011A0    _ReadFile+01A6
0012FEDC 00401057    PCIDLL!.text+01A0
0012FF80 004017C9    PCIEXE!.text+0057
0012FFC0 77F1BA3C    PCIEXE!.text+07C9
0012FFF0 00000000    _BaseProcessStart+0040
```

The following example shows the output of the STACK command in 16-bit mode. The command has been issued without any parameters, after a breakpoint is set in the message handler of a Windows program.

```
STACK

__astart at 0935:1021 [?]
WinMain at 0935:0d76 [00750]
    [BP+000C]hInstance 0935
    [BP+000A]hPrev  0000
    [BP+0006]lpszCmdLine
    [BP+0004]CmdShow
    [BP-0002]width  00DD
    [BP-0004]hWnd  00E5
USER!SENDMESSAGE+004F at 05CD:06A7
USER(01) at 0595:04A0 [?]  0595:048b
USER(06) at 05BD:1A83 [?]
=>ClockWndProc at 0935:006F [0179]
    [BP+000E]hWnd  1954
    [BP+000C]message  0024
    [BP+000A]wParam 0000
    [BP+0006]lParam  06ED:07A4
    [BP-0022]ps  0000
```

Each entry of the call stack in the 16-bit format contains the following information:

- Symbol name or module name in which the return address falls
- `SS:[E]BP` value of this entry
- Call instruction's source line number if available
- Address of the first line of this routine or the name of the routine that was called to reach this routine

If stack variables are available for this entry, the following information about each is displayed:

- `SS:[E]BP` relative offset
- Stack variable name
- Data in the stack variable if it is of type char, int, or long

SYM

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Display or set symbol.

Syntax

SYM [[***section-name***] !] ***symbol-name*** [***value***]]

section-name	A valid section-name or a partial section-name. You can use this parameter to display symbols in a particular section. If a section-name is specified, it must be followed by an exclamation point (!). For example, you could use the command `SYM .TEXT!` to display all symbols in the .TEXT section of the executable.
!	If "!" is the only parameter specified, the modules in this symbol table are listed.
symbol-name	A valid symbol-name. The symbol-name can end with an asterisk (*). This allows searching if only the first part of the symbol-name is known. The comma "," character can be used as a wildcard character in place of any character in the symbol-name.
value	The specific address to which the symbol is to be set. The *value* parameter is used to set a symbol to a specific address.

Use

Use the SYM command to display and set symbol addresses. If you enter SYM without parameters, all symbols display. The address of each symbol displays next to the symbol-name.

If you specify a symbol-name without a value, the symbol-name and its address display. If the symbol-name is not found, nothing displays.

If you specify a section name followed by an exclamation point (!) and then a symbol name or asterisk (*), SYM displays only symbols from the specified section.

The SYM command is often useful for finding a symbol when you can only remember a portion of the name. Two wildcard methods are available for locating symbols. If you specify a symbol-name ending with an asterisk (*), SYM displays all symbols that match the actual characters typed prior to the asterisk, regardless of their ending characters. If you use a comma (,) in place of a specific character in a symbol name, that character is a wild-card character.

If you specify a value, the address of all symbols that match symbol-name are set to the value.

Example

The following example displays all symbols that start with FOO display.

```
SYM foo
```

The following example sets all symbols that start with FOO to the address 6000.

```
SYM foo* 6000
```

The following example displays all sections for the current symbol table.

```
SYM !
```

The following example displays all symbols in section MAIN that start with FOO.

```
SYM main!foo*
```

SYMLOC

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Relocate the symbol base.

Syntax

For Windows 3.1

```
SYMLOC [segment-address  | o | r |
    (section-number selector linear-address)]
```

For Windows 9x and the Windows NT family

```
SYMLOC [segment-address  | o | r | -c process-type |
    (section-number selector linear-address)]
```

segment address	This parameter is only used to relocate MS-DOS programs.
o	For 16-bit Windows table only. Changes all selector values back to their ordinal state.
r	For 16-bit Windows table only. Changes all segment ordinals to their appropriate selector value.
-c	Specify a context value for a symbol table. Use when debugging DOS extended applications.
section-number	For 32-bit tables only. PE file 1 based section-number.
selector	For 32-bit tables only. Protected mode selector.
linear-address	For 32-bit tables only. Base address of the section.

Use

The SYMLOC command handles symbol fixups in a loaded symbol table. The command contains support for DOS tables, 16-bit protected mode Windows tables (using O and R commands only), and 32-bit protected mode tables. The 32-bit support is intended for 32-bit code that must be manually fixed up such as DOS 32-bit extender applications.

In an MS-DOS program, SYMLOC relocates the segment components of all symbols relative to the specified segment-address. This function is necessary when debugging loadable device drivers or other programs that cannot be loaded directly with the SoftICE Loader.

When relocating for a loadable device driver, use the value of the base address of the driver as found in the MAP command. When relocating for an .EXE program, the value is 10h greater than that found as the base in the MAP command. When relocating for a .COM program, use the base segment address that is found in the MAP command.

The MAP command displays at least two entries for each program. The first is typically the environment and the second is typically the program. The base address of the program is the relocation value.

For Windows 9x and the Windows NT family

The SYMLOC -C option allows you to associate a specific address context with the current symbol table. This option is useful for debugging an extender application on Windows NT family platforms where SoftICE would not be able to assign a context to the symbol table automatically.

Example

The following example relocates all segments in the symbol table relative to 1244. The +10 relocates a TSR that was originally an .EXE file. If it is a .COM file or a DOS loadable device driver, the +10 is not necessary.

```
SYMLOC 1244+10
```

The following example relocates all symbols in section 1 of the table to 401000h using selector 1Bh. Each section of the 32-bit table must be relocated separately.

```
SYMLOC 1 1b 401000
```

The following example sets the context of the current symbol table to the process whose process ID is 47. Subsequently, when symbols are used, SoftICE will automatically switch to that process.

```
SYMLOC -c 47
```

T

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Key

F8

Definition

Trace one instruction.

Syntax

T [=***start-address***] [***count***]

start-address	Address at which to begin execution.
count	Specify how many times SoftICE should single step before stopping.

Use

The T command uses the single step flag to single step one instruction.

Execution begins at the current CS:EIP, unless you specify the start-address parameter. If you specify this parameter, CS:EIP is changed to start-address prior to single stepping.

If you specify count, SoftICE single steps count times. Use the Esc key to terminate stepping with a count.

If the Register window is visible when SoftICE pops up, all registers that were altered since the T command was issued are displayed with the bold video attribute.

If the Code window is in source mode, this command single steps to the next source statement.

Example

The following example single-steps through eight instructions starting at memory location CS:1112.

```
T = cs:1112 8
```

TABLE

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Symbol/Source

Definition

Change or display the current symbol table.

Syntax

For Windows 3.1

TABLE [[**r**] ***partial-table-name***] | **autoon** | **autooff** | **$**

For Windows 9x and the Windows NT family

TABLE [***partial-table-name***] | **autoon** | **autooff** | **$**

r	Removes the table specified by *partial-table-name*.
partial-table-name	Symbol table name or enough of the first few characters to define a unique name.
autoon	Key word that turns auto table switching on.
autooff	Key word that turns auto table switching off.
$	Specify $ to switch to the table where the current instruction pointer is located.

Use

If you do not specify any parameters, all the currently loaded symbol tables are displayed with the current symbol table highlighted. If you specify a partial-table-name, that table becomes the current symbol table.

Use the TABLE command when you have multiple symbol tables loaded. SoftICE supports symbol tables for 16- and 32-bit Windows applications and DLLs, 32-bit Windows VxDs, Windows NT family device drivers, DOS programs, DOS loadable device drivers, and TSRs.

Symbols are only accessible from one symbol table at time. You must use the TABLE command to switch to a symbol table before using symbols from that table.

If you use the AUTOON keyword, SoftICE will switch to auto table switching mode. In this mode, SoftICE changes the current table to the table the instruction pointer is in when SoftICE pops up. AUTOOFF turns off this mode.

Tables are not automatically removed when your program exits. If you reload your program with the SoftICE Loader, the symbol table corresponding to the loaded program is replaced with the new one.

For Windows 3.1

If the R parameter precedes a partial-table-name, the specified table is removed. Specifying an asterisk (*) after the R parameter removes all symbol tables.

For Windows 9x and the Windows NT family

Symbol tables can be tied to a single address context or multiple address contexts. If a table is tied to a single context, switching to that table using the TABLE command switches to the appropriate address context. If you use any symbol from a context-sensitive table, SoftICE switches to that context. Use “View Symbol Tables” in the SoftICE Loader to remove tables from memory. The R parameter is not supported.

Example

In the following example, the TABLE command, used without parameters, lists all loaded symbol tables. In the sample output, GENERIC is highlighted because it is the current table. The amount of available symbol table memory is displayed at the bottom.

```
TABLE

  MYTSR.EXE
   MYAPP.EXE
   MYVXD
   GENERIC
  006412 bytes of symbol table memory available
```

In the following example, the current table is changed to MYTSR.EXE. Notice that only enough characters to identify a unique table were entered.

```
TABLE myt
```

TASK

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the Windows task list.

Syntax

TASK

Use

The TASK command displays information about all tasks that are currently running. The task that has focus is displayed with an asterisk after its name. This command is useful when a general protection fault occurs because it indicates which program caused the fault.

For the Windows NT family

The TASK command is process specific and only shows 16-bit tasks when used on Windows NT family platforms. In addition, it is only useful when the current context is that of an NTVDM process containing a WOW box. To view information on other processes, refer to *PROC* on page 253.

Output

For each running task, the following information displays:

Task Name	Name of the task.
SS:SP	Stack address of the task when it last relinquished control.
StackTop	Top of stack offset.
StackBot	Bottom of stack offset.
StackLow	Lowest value that SP has ever had when there was a context-switch away from the task.
TaskDB	Selector for the task data base segment.

hQueue Queue handle for the task. This is just the selector for the queue.

Events Number of outstanding events in the queue.

For Windows 3.1 and Windows 9x

The TASK command works for 16- and 32-bit tasks, however, the following fields change for 32-bit tasks:

StackBot Highest legal address of the stack shown as a 32-bit flat offset.

StackTop Lowest legal address of the stack shown as a 32-bit flat offset.

StackLow Field is not used.

SS:SP Contains the 16-bit selector offset address of the stack. If you examine the base address of the 16-bit selector, you see that this points to the same memory as does the flat 32-bit pointer used with the 32-bit data selector.

Example

The following example shows the use of the TASK command on Windows 3.1 running Win32s, and its output.

```
TASK
```

TaskNm	SS:SP	StackTop	StackBot	Low	TaskDB	hQueue	Events
FREECELL	21BF:7D96	86CE0000	86D00000		10FF	121F	0000
PROGMAN	17A7:200A	0936	2070	14CE	064F	07D7	0000
CLOCK	1427:1916	02E4	1A4E	143E	144F	1437	0000
MSWORD	* 29AF:913E	5956	93A4	7ADE	1F67	1F47	0000

THREAD

OS

Windows 9x

Type

System Information

Definition

Display information about a thread.

Syntax

THREAD [TCB | ID | task-name]

TCB	Thread Control Block.
ID	Thread ID number.
task-name	Name of a currently running 32-bit process.

Use

Tip: For the Windows NT family, refer to THREAD on page 300.

Use the THREAD command to obtain information about a thread.

- If you do not specify any options or parameters, the THREAD command displays information for every active thread in the system.
- If you specify a task-name as a parameter, all active threads for that process display.
- If you specify a TCB or ID, only information for that thread displays.

Output

For each thread, the following information is shown:

Ring0TCB	Address of the Ring-0 thread control block. This is the address that is passed to VxDs for thread creation and termination.
ID	VMM Thread ID.
Context	Context handle associated with the process of the thread.
Ring3TCB	Address of the KERNEL32 Ring-3 thread control block.
Thread ID	Ring-3 thread ID.

Process	Address of the KERNEL32 process database that owns the thread.
TaskDB	Selector of the task database that owns the thread.
PDB	Selector of the program database (protected-mode PSP).
SZ	Size of the thread which can be either 16 or 32 bit.
Owner	Process name of the owner.

If you specify TCB or ID, the following information displays for the thread with the specified TCB or ID:

- Current register contents for the thread.
- All thread local storage offsets within the thread. This shows the offset in the thread control block of the VMM TLS entry, the contents of the TLS entry, and the owner of the TLS entry.

Example

The following example displays the thread that belongs to the Winword process.

```
THREAD

Ring0T  ID    Contex  Ring3T  Thread  Proces  TaskD PDB  SZ  Owner
CB            t       CB      ID      s       B
C10518  008   C104B9  815842  FFF067  8158AA  274E  25B  32  *Winwo
08      B     90      CC      1F      A8            7        rd
```

The following example shows a partial listing of the information returned about the thread with ID 8B.

```
THREAD 8B

Ring0TCB  ID   Context   Ring3TCB  ThreadID Process  TaskDB PDB  SZ Owner
C1051808  008B C104B990  815842CC  FFF0671F 8158AAA8 274E   25B7 32 *Winword
CS:EIP=0137:BFF96868 SS:ESP=013F:0062FC3C DS=013F ES=013F FS=2EBF GS=0000
EAX=002A002E EBX=815805B8 ECX=815842CC EDX=815805B8 I S P
ESI=00000000 EDI=815805B8 EBP=0062FC80 ECODE=00000000
TLS Offset 007C = 00000000 VPICD
TLS Offset 0080 = 00000000 DOSMGR
TLS Offset 0084 = 00000000 SHELL
```

```
TLS Offset 0088 = C1053434 VMCPD
TLS Offset 008C = C104EA74 VWIN32
TLS Offset 0090 = 00000000 VFAT
TLS Offset 0094 = 00000000 IFSMgr
```

See Also

WT (Win9x).

THREAD

OS

Windows NT family

Type

System Information

Definition

Display information about a thread.

Syntax

THREAD [**-r** | **-x** | **-u** | **-w**] [***thread-type*** | ***process-type***]

-r	Display value of the thread's registers.
-x	Display extended information for each thread.
-u	Display threads with user-level components.
-w	Display a list of the objects that the thread is waiting on.
thread-type	Thread handle or thread ID.
process-type	Process-handle, process-id or process-name.

Use

Use the THREAD command to obtain information about a thread.

- If you do not specify any options or parameters, the THREAD command displays information for every active thread in the system.
- If you specify a process-type as a parameter, all the active threads for that process display.
- If you specify a thread-type, only information for that thread displays.

Tip: *For Windows 9x, refer to THREAD on page 297.*

For the -R and -X options, the registers shown are those that are saved on the thread context switches: ESI, EDI, EBX and EBP.

Output

For each thread, the following summary information is displayed:

TID	Thread ID.

Krnl TEB Kernel Thread Environment Block.

StackBtm Address of the bottom of the thread's stack.

StackTop Address of the start of the thread's stack.

StackPtr Threads current stack pointer value.

User TEB User thread environment block.

Process(Id) Owner process-name and process-id.

When you specify extended output (-x), THREAD displays many fields of information about thread environment blocks. Most of these fields are self-explanatory, but the following are particularly useful and deserve to be highlighted:

TID Thread ID.

KTEB Kernel Thread Environment Block.

Base Pri, Dyn. Pri Threads base priority and current priority.

Mode Indicates whether the thread is executing in user or kernel mode.

Switches Number of context switches made by the thread.

Affinity Processor affinity mask of the thread. Bit positions that are set represent processors on which the thread is allowed to execute.

Restart Address at which the thread will start executing when it is resumed.

The thread's stack trace is displayed last.

Example

The following example uses the THREAD command to display the threads that belong to the Explorer process:

```
THREAD explorer

TID   Krnl TEB StackBtm StkTop   StackPtr User TEB Process(Id)
006A  FD857DA0 FB1CB000 FB1CD000 FB1CCED8 7FFDE000 Explorer(6B)
006F  FD854620 FB235000 FB237000 FB236B2C 7FFDD000 Explorer(6B)
007C  FD840020 FD72F000 FD731000 FD730E24 7FFDB000 Explorer(6B)
```

The following example displays extended information on the thread with ID 5Fh:

```
THREAD -x 5f
                        Extended Thread Info for thread 5F
    KTEB:       FD850D80  TID:        05F  Process:   Explorer(60)
    Base Pri:          D  Dyn. Pri:     E  Quantum:          2
    Mode:       User      Suspended:    0  Switches:  00024B4F
    TickCount:  00EE8DA4  Wait Irql:    0
    Status:     User Wait for WrEventPair
    Start EIP:       KERNEL32!LeaveCriticalSection+0058 (6060744C)
    Affinity:        00000001              Context Flags:        A
    KSS EBP:         FB1C3F04              Callback ESP:  00000000
    Kernel Stack:    FB1C2000 - FB1C4000   Stack Ptr:     FB1C3ED8
    User Stack:      00030000 - 00130000   Stack Ptr:     0012FE3C
    Kernel Time:     0000014A              User Time:     0000015F
    Create Time:     01BB10646E2DBE90
    SpinLock:   00000000  Service Table: 80174A40  Queue:    00000000
    SE Token:   00000000  SE Acc. Flags: 001F03FF
    UTEB:       7FFDE000  Except Frame:  0012FEB4  Last Err: 00000006
    Registers:  ESI=FD850D80  EDI=0012FEC4  EBX=77F6BA0C
       EBP=FB1C3F04
    Restart  :  EIP=80168757 a.k.a. _KiSetServerWaitClientEvent+01CF
Explorer!.text+975D at 001B:0100A75D
Explorer!.text+9945 at 001B:0100A945
Explorer!.text+A3F8 at 001B:0100B3F8
USER32!WaitMessage+004F at 001B:60A0CA4B
user32!.text+070A at 001B:60A0170A
=> ntdll!CsrClientSendMessage+0072 at 001B:77F6BA0C
```

See Also

WT (WinNT family).

TIMER

OS

Windows NT family

Type

System Information

Definition

Display information about timer objects.

Syntax

TIMER [***timer-address***]

timer-address	Location of a timer object.

Use

Displays the system timer objects or the contents of a specific timer object.

Example

The following example shows a portion of the output of the TIMER command when it is issued with no parameters.

```
TIMER

Timer      DPC        DPC        Remaining
Object     Address    Context    Time          Signaled   Period
Symbol
80706588                           10.233s      FALSE
80681C48                           10.233s      FALSE
8074E108                           62.787s      FALSE
80730DE8                           10.248s      FALSE
FBDA3980   FBD47C80   00000000     18.588ms     FALSE
NTice!.text+000479C0
FC392EB0   F74D0B4C   FC392E80     19.884ms     FALSE
TDI!.text+088C
806DAD68                           22.633ms     FALSE
8066A108                           29.323ms     FALSE
807946D8   80802E90   807946A8    180.777s      FALSE
807AF048                           59.942ms     FALSE
8078D1A8   80802EF0   8078D1A8     79.971ms     FALSE
807079C8                            5.223s      FALSE
8074B108                           68.043s      FALSE
8073D108                         159.510ms    FALSE
```

The following example shows the output of TIMER when it is issued for a specific timer object.

```
TIMER 80793568

Timer Object at 80793568
Dispatcher Type: 08
Dispatcher Size: 010A
Signal State: Not Signaled
Dispatch Wait List Forward Link: <self>
Dispatch Wait List Back Link: <self>
Remaining Time:  349.784ms
Timer List Forward Link: 8014D828
Timer List Back Link: 8014D828
Timer Object is NOT Periodic
Timer DPC: 80793548
DPC Routine: F74D0B4C  TDI!.text+088C
DPC Context: 80793538
```

See Also

APC; DPC

TRACE

OS

Windows 3.1, Windows 9x

Type

Symbol/Source

Key

CTRL-F9 (TRACE B: CTRL-F12)

Definition

Enter or exit Trace simulation mode.

Syntax

TRACE [b | off | *start*]

b	Start tracing from the oldest instruction in the back trace history buffer.
off	Exit from trace simulation mode.
start	Hexadecimal number specifying the index within the back trace history buffer from which to start tracing. An index of 1 corresponds to the newest instruction in the buffer.

Use

Use the TRACE command to enter, exit, and display the current state of the trace simulation mode. TRACE with no parameters displays the current state of trace simulation mode. TRACE followed by off exits from trace simulation mode and returns to regular debugging mode. TRACE B enters trace simulation mode starting from the oldest instruction in the back trace history buffer. TRACE followed by a start number enters trace simulation mode at the specified index within the back trace history buffer.

You can use the trace simulation mode only if the back trace history buffer contains instructions. To fill the back trace history buffer, use the BPR command with either the T or TW parameter to specifying a range breakpoint.

When trace simulation mode is active, the help line at the bottom of the SoftICE screen signals the trace mode and displays the index of the current instruction within the back trace history buffer.

Use the XT, XP, and XG commands to step through the instructions in the back trace history buffer from within the trace simulation mode. When stepping through the back trace history buffer, the only register that changes is the EIP register, because back trace ranges do NOT record the contents of all the registers. You can use all the SoftICE commands within trace simulation mode except for the following: X, T, G, P, HERE, and XRSET.

Example

The following example enters trace simulation mode starting at the eighth instruction in the back trace history buffer.

```
TRACE 8
```

See Also

BPR; BPRW; SHOW

TSS

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display task state segment and I/O port hooks.

Syntax

For Windows 3.1

TSS

For Windows 9x and the Windows NT family

TSS [***TSS-selector***]

TSS-selector	Any GDT selector that represents a TSS.

Use

This command displays the contents of the task state segment after reading the task register (TR) to obtain its address.

You can display any 32-bit TSS by supplying a valid 32-bit Task Gate selector as a parameter. Use the GDT command to find TSS selectors. If you do not specify a parameter, the current TSS is shown.

Output

The following information is displayed:

TSS selector value	TSS selector number.
selector base	Linear address of the TSS.
selector limit	Size of the TSS.

The next four lines of the display show the contents of the register fields in the TSS. The following registers are displayed:

```
LDT, GS, FS, DS, SS, CS, ES, CR3
EAX, EBX, ECX, EDX, EIP
ESI, EDI, EBP, ESP, EFLAGS
Level 0, 1 and 2 stack SS:ESP
```

For Windows 3.1 and Windows 9x

On Windows 3.1 and Windows 9x, the TSS command also displays the TSS bit mask array. The bit mask array shows each I/O port that has been hooked by a Windows virtual device driver (VxD). For each port, the following information is displayed:

port number	16-bit port number.
handler address	32-bit flat address of the port's I/O handler. All I/O instructions on the port will be reflected to this handler.
handler name	Symbolic name of the I/O handler for the port. If symbols are available for the VxD, the nearest symbol is displayed; otherwise the name of the VxD followed by the handler's offset within the VxD is displayed.

For Windows 9x and the Windows NT family

On Windows 9x and the Windows NT family, the TSS command also displays the I/O permission map base and size. A size of zero indicates that all I/O is trapped. A non-zero size indicates that the I/O permission map determines if an I/O port is trapped.

Example

The following example displays the task state segment in the Command window. The output of the bit mask array is abbreviated.

```
TSS

TR=0018  BASE=C000AEBC  LIMIT=2069
LDT=0000  GS=0000  FS=0000  DS=0000  SS=0000  CS=0000  ES=0000
CR3=00000000
EAX=00000000  EBX=00000000  ECX=00000000  EDX=00000000
EIP=00000000
ESI=00000000  EDI=00000000  EBP=00000000  ESP=00000000
EFL=00000000
SS0=0030:C33EEFA8  SS1=0000:00000000  SS2=0000:00000000
I/O Map Base=0068  I/O Map Size=2000


Port  Handler   Trapped  Owner
0000  C00C3E92  Yes      VDMAD(01)+17BA
0001  C00C3F0E  Yes      VDMAD(01)+1836
0002  C00C3E92  Yes      VDMAD(01)+17BA
0003  C00C3F0E  Yes      VDMAD(01)+1836
0004  C00C3E92  Yes      VDMAD(01)+17BA
0005  C00C3F0E  Yes      VDMAD(01)+1836
0006  C00C3E92  Yes      VDMAD(01)+17BA
0007  C00C3F0E  Yes      VDMAD(01)+1836
0008  C00C3C55  Yes      VDMAD(01)+157D
0009  C00C3D98   Yes      VDMAD(01)+16C0
```

If you are interested in which VxD has hooked port 21h (interrupt mask register), you would look at the TSS bit mask output of the TSS display for the entry corresponding to the port. The following output, taken from the TSS command's output, indicates that the port is hooked by the virtual PIC device and its handler is at offset 800792B4 in the flat code segment. This corresponds to an offset of 0AF8h bytes from the beginning of VPICD's code segment.

```
0021 800792B4 VPICD+0AF8
```

TYPES

OS

Windows 9x and the Windows NT family

Type

Symbol/Source Command

Definition

List all types in the current context or list all type information for the specified type-name .

Syntax

TYPES [***type-name***]

type-name	List all type information for the specified type-name.

Use

If you do not specify a type-name, TYPES lists all the types in the current context. If you do specify a type-name, TYPES lists all the type information for the type-name you specified. If the type-name you specified is a structure, TYPES expands the structure and lists the typedefs for its members.

Example

The following example displays all the types in the current context. The example output is only a partial listing.

```
TYPES
Size       Type Name                  Typedef
0x0004     ABORTPROC                  int stdcall (*proc) (void)
0x0004     ACCESS_MASK                unsigned long
0x0004     ACL_INFORMATION_CLASS      int
0x0018     ARRAY_INFO                 struct ARRAY_INFO
0x0002     ATOM                       unsigned short
0x0048     BALLDATA                   struct _BALLDATA
0x0048     _BALLDATA                  struct _BALLDATA
0x0020     _BEZBUFFER                 struct _BEZBUFFER
0x0004     BOOL                       int
0x0001     BOOLEAN                    unsigned char
0x0010     _BOUNCEDATA                struct _BOUNCEDATA
0x0004     BSTR                       unsigned short *
```

The following example displays all type information for the type-name _bouncedata:

```
TYPES _bouncedata
typedef struct _BOUNCEDATA {
public:
   void * hBall1 ;
   void * hBall2 ;
   void * hBall3 ;
   void * hBall4 ;
};
```

See Also

LOCALS; WL

U

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Display/Change Memory

Definition

Unassemble instructions.

Syntax

For Windows 3.1

U [***address***] | [***symbol-name***]

For Windows 9x and the Windows NT family

U [***address*** [**L** ***length***]]

address	Segment offset or selector offset.
symbol-name	Scrolls the Code window to the function you specify.
length	Number of instruction bytes.

Use

The U command displays either source code or unassembled code at the specified address. The code displays in the current mode (either code, mixed, or source) of the Code window,. Source displays only if it is available for the specified address. To change the mode of the Code window, use the SRC command (default key F3).

If you do not specify the address, the command unassembles at the address where you left off.

If the Code window is visible, the instructions display in the Code window, otherwise they display in the Command window. The Command window displays either eight lines or one less than the length of the Command window.

To make the Code window visible, use the WC command (default key Alt-F3). To move the cursor to the Code window, use the EC command (default key F6).

If the instruction is at the current CS:EIP, the U command displays the instruction using the reverse video attribute. If the current CS:EIP instruction is a relative jump, the instruction contains either the string JUMP or NO JUMP, indicating whether or not the jump will be taken. If the jump will be taken, an arrow indicates if the jump will go up or down in the Code window. If the current CS:EIP instruction references a memory location, the U command displays the contents of the memory location in the Register window beneath the flags field. If the Register window is not visible, this value displays at the end of the code line.

If a breakpoint is set on an instruction being displayed, the code line is displayed using the bold attribute.

If any of the memory addresses within an instruction have a corresponding symbol, the symbol displays instead of the hexadecimal address. If an instruction is located at a code symbol, the symbol name displays on the line above the instruction.

To view or suppress the actual hexadecimal bytes of the instruction, use the CODE command.

For Windows 9x and the Windows NT family

If you specify a length, SoftICE disassembles the instructions in the Command window instead of the Code window. This is useful for reverse engineering, for example, disassembling an entire routine and then using the SoftICE Loader Save SoftICE History function to capture the output to a file.

Example

The following example unassembles instructions beginning at 10 hexadecimal bytes before the current address.

```
U eip - 10
```

The following example displays source in the Code window starting at line number 121.

```
U .121
```

For Windows 9x and the Windows NT family

The following command disassembles 100h bytes starting at MyProc and displays the output in the Command window.

```
U myproc L100
```

USB

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Displays information about USB host controllers installed in the system.

Syntax

USB [-dumpregs | -schedule] [host controller number]

-dumpregs	Produces a detailed listing of the contents of the device's control registers.
-schedule	Displays the current contents of the USB transaction schedule for the specified host controller.
host controller number	Specifies host controller number from the list generated by the USB command with no parameters.

Use

The USB command displays information about the USB host controllers installed in the system. Issued with no parameters, the USB command will display a numbered list of the host controllers detected. The -dumpregs and -schedule switches both require the user to specify a host controller number from the list. USB **-dumpregs** [HC number] will show the contents of the control registers for the specified host controller, while USB **-schedule** [HC number] will display the current contents of the USB transaction schedule for the specified host controller.

The output produced by the USB command with no parameters will contain a numbered list of the USB controllers in the system, in the order they were detected by SoftICE. It will also display which of the host controller specifications the device complies with, UHCI, or Universal Host Controller Interface; or OHCI, the Open Host Controller Interface. (EHCI, currently the only host controller specification for USB 2.0, will be supported in a future release of SoftICE). Which specification the host controller supports will determine the output from the -dumpregs and -schedule options. The PCI address of each device is also listed, allowing the user to easily access more information about the device using the PCI command.

The **-dumpregs switch** will produce a detailed listing of the contents of the device's control registers. Host controller registers are defined by the host controller specification the device conforms to, so the output from this command will differ depending on the HC type. The user will need to consult the host controller specifications themselves for a detailed description of the various control registers.

The **-schedule switch** produces a list of the currently active entries in the host controller's schedule. This command also accepts a **verbose switch (-v)**, which will cause it to display inactive entries as well. For UHCI controllers the entire schedule is displayed, but for OHCI controllers this command displays only the interrupt entries in the schedule; bulk and isochronous transactions are not shown.

Note: If SoftICE is set up to use a USB keyboard or mouse when the USB -schedule command is issued, you may see SoftICE's own entries in the USB schedule, rather than Windows'. This is because SoftICE patches the USB schedule when it is popped up, in order to use the keyboard and mouse. The patching will only affect USB keyboard and mouse devices, not all USB devices in the system. If you need to see the USB schedule with Windows' keyboard and mouse schedule entries intact, you should disable SoftICE's USB input device support using the Troubleshooting tab in the DriverStudio Configuration (Settings) dialog.

Example

This is the output from the USB command on a particular system.

```
USB

3 USB Host Controllers Found
 HC 0: UHCI at PCI Bus  0 Device 1F Function  2
 HC 1: UHCI at PCI Bus  0 Device 1F Function  4
 HC 2: OHCI at PCI Bus  4 Device  F Function  0
```

Here is the output from the -dumpregs command, shown on a UHCI controller:

```
USB -du 0
USB I/O registers for Host Controller 00:
Universal Host Controller at PCI Bus 00 Device 1F Function 02
USB Command (FF80) = 0081
 MaxP:64Bytes CF:0 SWDBG:0 FGR:0 EGSM:0 GRST:0 HCRST:0 R/
S:Run
USB Status (FF82) = 0001
 HCHalted:0 HCProcError:0 HostErr:0 ResumeDtct:0 USBErrIntr:0
USBIntr:1
USB Interrupt Enable (FF84) = 000F
 Short Packet:1 IOC:1 Resume:1 Timeout/CRC:1
Frame Number (FF86) = 0050
FrameList BaseAddr (FF88) = 02BCE160
Start of Frame Modifier (FF8C) = 40 (12000 clocks/frame)
Port 1 Status/Control (FF90) = 0095
 Suspend:Enabled Rst:0 LowSpd:0 ResumeDtct:0 LineStat:1
 EnabChng:0 Enab:1 CStatChng:0 CStat:1
Port 2 Status/Control (FF92)   = 0080
 Suspend:Enabled Rst:0 LowSpd:0 ResumeDtct:0 LineStat:0
 EnabChng:0 Enab:0 CStatChng:0 CStat:0
Legacy Support = 00003F00
 A20PTS:0 USBPIRQDEn:1 USBIRQS:1 TBy64W:1 TBy64R:1 TBy60W:1
TBy60R:1
 SMIEPTE:0 PSS:0 A20PTEn:0 USBSMIEn:0 64WEn:0 64REn:0 60WEn:0
60REn:0
```

Here is some of the output from the -schedule command. This example shows only the first few entries; the complete USB schedule is quite long.

```
USB -sc 0

USB Transaction Schedule for Host Controller 0:
Universal Host Controller at PCI Bus 0 Device 31 Function 2
USB schedule at 827CE000

------------------------

Frame 0 at 827CE000
 =====Queue entry at 02DAF000=====
 Horiz Link Ptr: 02BCF3C0 (Queue:1 T:0)
 Vert Link Ptr:  02DAF100 (Queue:0 T:0)
 -------TD at 02DAF100-------
 Next Entry: 00000000 (Vf:0 Queue:0 T:1)
 SPD:1 C_ERR:3 LS:0 ISO:0 IOC:1  ActLen:800 bytes
 Status (Act:1 Stalled:0 DBErr:0 Babble:0 NAK:1 CRC/TMout:0
BitErr:0)
 MaxLen: 1  DataPID:0  EndPoint: 1  DevAddr: 1  PID: 69
 Buffer address: 02F16E70
 =======End Q=======
Frame 1 at 827CE004
 =====Queue entry at 02B5E000=====
 Horiz Link Ptr: 02BCF100 (Queue:1 T:0)
 Vert Link Ptr:  02D26460 (Queue:0 T:0)
 -------TD at 02D26460-------
 Next Entry: 02D26380 (Vf:0 Queue:0 T:0)
 SPD:1 C_ERR:3 LS:1 ISO:0 IOC:0  ActLen:800 bytes
 Status (Act:1 Stalled:0 DBErr:0 Babble:0 NAK:1 CRC/TMout:0
BitErr:0)
 MaxLen: 4  DataPID:1  EndPoint: 1  DevAddr: 2  PID: 69
 Buffer address: 02D26470
```

VCALL

OS

Windows 3.1, Windows 9x

Type

System Information

Definition

Display the names and addresses of VxD callable routines.

Syntax

VCALL [***partial-name***]

partial-name	VxD callable routine name or the first few characters of the name. If more than one routine's name matches the partial-name, VCALL lists all routines that start with the specified characters.

Use

The VCALL command displays the names and addresses of Windows VxD API routines. These are Windows services provided by VxDs for other VxDs. All the routines SoftICE lists are located in Windows system VxDs that are included as part of the base-line Windows kernel.

The addresses displayed are not valid until the VMM VxD is initialized. If an X is not present in the SoftICE initialization string, SoftICE pops up while Windows is booting and VMM is not initialized.

The names of all VxD APIs are static. Only the function names provided in the Windows DDK Include Files are available. These API names are not built into the final VxD executable file. SoftICE provides API names for the following VxDs:

CONFIGMG	IOS	VCD	VMCPD	VSD
DOSMGR	NDIS	VCOMM	VMD	VTD
DOSNET	PAGEFILE	VCOND	VMM	VWIN32

EBIOS	PAGESWAP	VDD	VMPOLL	VXDLDR
ENABLE	SHELL	VDMAD	VNETBIOS	
IFSMGR	V86MMGR	VFBACKUP	VPICD	
INT13	VCACHE	VKD	VREDIR	

Example

The following example lists all Windows system VxD calls that start with Call. Sample output follows the command.

```
VCALL call

80006E04              Call_When_VM_Returns
80009FD4              Call_Global_Event
80009FF4              Call_VM_Event
8000A018              Call_Priority_VM_Event
8000969C              Call_When_VM_Ints_Enabled
800082C0              Call_When_Not_Critical
8000889F              Call_When_Task_Switched
8000898C              Call_When_Idle
```

VER

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Miscellaneous

Definition

Display the SoftICE version number.

Syntax

VER

Note: To view your registration information and product serial number, start SoftICE Loader and choose "About SoftICE Loader" from the Help menu.

Example

The following example displays the SoftICE version number and operating system version.

```
VER
```

VM

OS

Windows 3.1, Windows 9x

Type

System Information

Definition

Display information on virtual machines.

Syntax

VM [-S] [VM-ID]

-S	Switches to the VM identified by the VM-ID.
VM-ID	Index number of the virtual machine. Index numbers start at 1. Index number 1 is always assigned to the Windows System VM, the VM in which Windows applications run.

Use

If no parameters are specified, the VM command displays information about all virtual machines (VM) in the system. If a VM-ID is specified, the register values of the VM are displayed. These registers are those found in the client register area of the virtual machine control block, so they represent the values last saved into the control block when there was a context switch away from the VM. If SoftICE is popped up while a VM is executing, the registers displayed in the SoftICE Register window, not the ones shown in the VM command output, are the current registers for the VM. However, if you are in the first few instructions of an interrupt routine in which a virtual machine's registers are being saved to the control block, the CS:IP register may be the only valid register. The others will not have been saved yet.

The command displays two sets of segment registers plus the EIP and SP registers. The segment registers are used for the protected mode and the real mode contexts of the VM. If a VM was executing in protected mode last, the protected mode registers are listed first. If V86 mode was the last execution mode, the V86 segment registers are listed first. The general purpose registers, displayed below the segment registers, correspond to the segment registers listed first.

A VM is a unit of scheduling for the Windows kernel. A VM can have one protected mode thread under Windows 3.1, and multiple protected mode threads under Windows 9x. In both cases, the VM has one V86 mode thread of execution. Windows, Windows applications, and DLLs all run in protected mode threads of VM 1 (the System VM).

VMs other than the System VM normally have a V86 thread of execution only. However, DPMI applications (also known as DOS extended applications) launched from these VMs can also execute in a protected mode thread.

The VM command is very useful for debugging VxDs, DPMI programs, and DOS programs running under Windows. For example, if the system hangs while running a DOS program, you can often use the VM command to find the address of the last instruction executed. The last instruction would be the CS:EIP shown for the VM's V86 thread.

The VM command can also be very valuable when Windows faults all the way back to DOS. That is, when Windows cannot handle a fault and exits Windows, your computer is left at the DOS prompt.

In this case, set I1HERE ON in SoftICE and duplicate the problem so that Windows executes an INT 1 prior to returning to DOS. When the fault happens, SoftICE pops up. You can then use the VM command to find out the last address of execution and the CR command to find the fault address. CR2 contains the fault address. The ESI register usually points to an error message at this point.

Output

For each virtual machine, VM displays the following information.

VM Handle — VM handle is actually a flat offset of the data structure that holds information about the VM.

Status — This is a bit mask that shows current state information for the VxD. The values are as follows:

0001H	Exclusive mode
0002H	Runs in background
0004H	In process of creating
0008H	Suspended
0010H	Partially destroyed
0020H	Executing protected mode code
0040H	Executing protected mode app

0080H	Executing 32-bit protected app
0100H	Executing call from VxD
0200H	High priority background
0400H	Blocked on semaphore
0800H	Woke up after blocked
1000H	Part of V86 App is pageable
2000H	Rest of V86 is locked
4000H	Scheduled by time-slices
8000H	Idle, has released time slice

High Address — Alternate address space for VM. This is where a VxD typically accesses VM memory (instead of 0).
Note: It is likely that parts of the VM will be paged out when SoftICE pops up.

VM-ID — Index number of this VxD, starting at 1.

Client Registers — Address of the saved registers of this VM. This address actually points into the level 0 stack for this VM.

Example

The following example shows the use of the VM command without parameters.

```
VM

VM Handle    Status      High Addr    VM-ID        Client Regs
806A1000     00004000    81800000     3            806A8F94
8061A000     00000008    81400000     2            80515F94
80461000     00007060    81000000     1            80013390
```

VXD

OS

Windows 3.1

Type

System Information

Definition

Display the Windows VxD map.

Syntax

VXD [***VxD-name*** | ***partial-VxD-name***]

VxD-name	Name of a virtual device driver.
partial-VxD-name	First few characters of the name.

Use

This command displays a map of all Windows virtual device drivers in the Command window. If no parameters are specified, all VxDs are displayed. If a VxD-name is specified, only information about the VxD with that name displays.

Tip: *For Windows 9x, refer to VXD on page 328.*

If a partial name is specified, SoftICE displays information on all VxDs whose name begins with the partial name.

Information that is shown about a VxD includes the VxD's control procedure address, its Protected Mode and V86 API addresses, and the addresses of all VxD services it implements. If the current CS:EIP belongs to one of the VxD's in the map, the line with the address range that contains the CS:EIP will be highlighted.

Output

If no parameters are specified, each entry in the VxD map contains the following information:

VxD name	Name specified in the .DEF file when the VxD was built.
address	Flat 32-bit address of one VxD section. VxDs are comprised of multiple sections where each section contains both code and data. (i.e. LockCode, LockData would be one section.)

size	Length of the VxD section. This includes both the code and the data of the VxD group.
code selector	Flat code selector.
data selector	Flat data selector.
type	Section number from the .386 file.
id	VxD ID number. The VxD ID numbers are used to obtain the Protected Mode and V86 API addresses that applications call.
DDB	Address of the VxDs Device Descriptor Block (DDB). This is a control block that contains information about the VxD such as the address of the Control Procedure and addresses of APIs.

If a VxD name is specified, the following information is displayed in addition to the previous information:

Control Procedure	Routine to which all VxD messages are dispatched.
Protected Mode API	Address of the routine where all services called by protected mode applications are processed.
V86 API Address	Address of the routine where all services called by V86 applications are processed.
VxD Services	List of all VxD services that are callable from other VxDs. For the Windows system VxDs, both the name and the address of the routines are displayed.

Example

The following example displays the VxD map in the Command window. The first few lines of the display would look something like the following. You can use the VxD names in the table as symbol names. The address of seg 1 will be used when a VxD name is used in an expression.

```
VXD

VxDName Address   Length    Code      Data     Type     ID   DDB
VMM     80001000  000193D0  0028      0030     LGRP     01
VMM     80200000  00002F1C  0028      0030     IGRP
LoadHi  8001A3d0  000007E8  0028      0030     LGRP     02
LoadHi  80202F1C  00000788  0028      0030     IGRP
```

WINICE	8001ABB8	00027875	0028	0030	LGRP
CV1	80042430	0000036B	0028	0030	LGRP
VDDVGA	8004279C	00007AD8	0028	0030	LGRP
VDDVGA	802036A8	000005EC	0028	0030	IGRP

See Also

For Windows 9x platforms, refer to *VXD* on page 328.

VXD

OS

Windows 9x

Type

System Information

Definition

Display the Windows VxD map.

Syntax

VXD [***VxD-name***]

VxD-name	Name or partial name of one or more virtual device drivers.

Use

Use this command to obtain information about one or more VxDs. If you do not specify any parameters, it displays a map of all the Windows virtual device drivers that are currently loaded in the system. Dynamically loaded VxDs are listed after statically loaded VxDs. If a VxD-name is specified, only that VxD, or VxDs with the same string at the start of their name are displayed. For example, VM will match VMM and VMOUSE. If the current CS:EIP belongs to one of the VxDs in the map, the line with the address range that contains the CS:EIP is highlighted.

Tip: *For Windows 3.1, refer to VXD on page 325.*

If no parameters are specified, each entry in the VxD map contains this information:

VxDName	VxD Name.
Address	Base address of the segment.
Length	Length of the segment.
Seg	Section number from the executable.
ID	VxD ID.
DDB	Address of the VxD descriptor block.
Control	Address of the control dispatch handler.
PM	Y, if the VxD has a protected mode API. N otherwise.
V86	Y, if the VxD has a V86 API. N otherwise.

VXD	Number of VxD services implemented.
Win32	Number of Win32 services implemented.

If a unique VxD name is specified, the following additional information appears:

Init Order	Order in which VxDs receive control messages. A zero value indicates highest priority.
Reference Data	The dword value that was passed from the real mode initialization procedure (if any) of the VxD.
Version	VxD version number.
PM API	PM API FLAT procedure address and PM API Ring-3 address used by applications. Refer to the following comments on PM and V86 APIs.
V86 API	V86 API FLAT procedure address and V86 API Ring-3 address used by applications. Refer to the next comments on PM and V86 APIs.

The PM API and V86 API parameters are register based and it is up to the individual VxD to define subfunctions and parameter passing (on entry EBX-VM Handle, EBP-client registers). If the Ring-3 address shown is 0:0, it means that no application code has yet requested the API address through INT 2F function 1684h.

When the VxD being listed has a Win32 service table, the following information is presented for each service:

Service Number	Win32 Service Number.
Service Address	Address of the service API handler.
Params	Number of dword parameters the service requires.

When the VxD being listed has a VxD service table, the following is shown for each service:

Service Number	VxD service number.
Service Address	Flat address of service.
Service Name	Symbol name if known (from VCALL list).

Example

The following example displays the VxD map in the Command window. The first few lines of the display look similar to the following. You can use the VxD as symbol names. The address of Seg 1 is used when a VxD name is used in an expression.

```
VXD

VxD Name Address  Length Seg  ID   DDB      Control  PM    V86 VxD  Win32
VMM      C0001000 00FDC0 0001 0001 C000E990 C00024F8 Y     Y   402  41
VMM      C0200000 000897 0002
VMM      C03E0000 000723 0003
VMM      C0320000 000095 0004
VMM      C0360000 00ED50 0005
VMM      C0260000 007938 0006
```

See Also

For Windows 3.1 platforms, refer to *VXD* on page 325.

WATCH

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Watch

Definition

Add a watch expression.

Syntax

WATCH ***expression***

Use

Use the WATCH command to display the results of expressions. SoftICE determines the size of the result based on the expression's type information. If SoftICE cannot determine the size, dword is assumed. The expressions being watched are displayed in the Watch window. There can be up to eight watch expressions at a time. Every time the SoftICE screen is popped up, the Watch window displays the expression's current values.

Each line in the Watch window contains the following information:

- Expression being evaluated.
- Expression type.
- Current value of the expression displayed in the appropriate format.

A plus sign (+) preceding the type indicates that you can expand it to view more information. To expand the type, either double-click the type or press Alt-W to enter the Watch window, use the UpArrow and DownArrow keys to move the highlight bar to the type you want to expand, and press Enter.

If the expression being watched goes out of scope, SoftICE displays the following message: "Error evaluating expression".

To delete a watch, use either the mouse or keyboard to select the watch and press Delete.

Example

The following example creates an entry in the Watch window for the variable hInstance.

```
WATCH hInstance
```

The following example indicates that the type for hInstance is void pointer (void *) and its current value is 0x00400000.

```
hPrevInstance void * = 0x00400000
```

The following example displays the dword to which the DS:ESI registers point.

```
WATCH ds:esi
      ds:esi void * = 0x8158D72E
```

To watch what ds:esi points to, use the pointer operator (*):

```
WATCH * ds:esi
```

The following example sets a watch on a pointer to a character string lpszCmdLine. The results show the value of the pointer (0x8158D72E) and the ASCII string (currently null).

```
WATCH lpszCmdLine +char * =0x8158D72E <"">
```

Double-clicking on this line expands it to show the actual string contents.

```
lpszCmdLine -char * =0x8158D72E
     char = 0x0
```

See Also

Alt-W; WW

WC

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Alt + F3

Definition

Toggle the Code window open or closed; and set the size of the Code window.

Syntax

WC [**+** | -][***window-size***]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify window-size, WC toggles the window open or closed. If the Code window is closed, WC opens it; and if it is open, WC closes it.

If you specify the window-size, the Code window is resized. If it is closed, WC opens it to the specified size.

When the Code window is closed, the extra screen lines are added to the Command window. When the Code window is opened, the lines are taken from the other windows in the following order: Command and Data.

If you wish to move the cursor to the Code window, use the EC command (default key F6).

Example

If the Code window is closed, the following example displays the window and sets it to twelve lines. If the Code window is open, the example sets it to twelve lines.

```
WC 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WC +6
```

See Also

WD; WF; WL; WR; WS; WT; WW; WX

WD

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Alt-F2

Definition

Toggle Data Window *n* open or closed, and optionally, set the size of Data Window *n*.

Syntax

WD[.0 |.1 | .2 |.3][+ | -][*window-size*]

.0 | *.1* | *.2* | *.3*	Optional switch to identify the Data Window Number.
+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify the window-size or Data Window Number, the **WD** command toggles Data Window 0 (the default Data Window) open or closed. If Data window 0 is closed, **WD** opens it; and if it is open, **WD** closes it.

If you *do* specify the window number and window-size, Data Window *n* is resized. If it is closed, the command opens it to the specified size.

When a Data Window is closed, the extra screen lines from the Data Window are added to the Command window. When a Data Window is opened, the lines are taken from the other windows in the following order: Command and Code.

If you wish to move the cursor to the Data Window to edit data, use the **E** command.

Example

If Data Window 2 is closed, the following example displays the window and sets it to twelve lines. If Data Window 2 is open, the example sets it to twelve lines.

```
WD.2 12
```

The following example expands the twelve-line Data Window 2 (set in the previous example) to eighteen lines.

```
WD.2 +6
```

See Also

WC; WF; WL; WR; WS; WT; WW; WX

OS

Windows 9x and the Windows NT family

Type

Window Control

Key

CTRL-F3

Definition

Display the floating point stack in either floating point or MMX format.

Syntax

WF [-d] [b | w | d | f | p | *]

-d	Display the floating point stack in the Command window. In addition to the registers, both the FPU status word and the FPU control word display in ASCII format.
b	Display the floating point stack in byte hexadecimal format.
w	Display the floating point stack in word hexadecimal format.
d	Display the floating point stack in dword hexadecimal format.
f	Display the floating point stack in 10-byte real format.
p	Display the floating point stack as packed 32-bit floating point. This is the AMD 3DNow format.
*	Display the “next” format. The “*” keyword is present to allow cycling through all the display formats by pressing a function key.

Use

WF with no parameters toggles the display of the floating point Register window. The window occupies four lines and is displayed immediately below the Register window. In 10 byte real format, the registers are labeled ST0-ST7. In all other formats the registers are labeled MM0-MM7.

If the floating point stack contains an unmasked exception, SoftICE will NOT display the stack contents. When reading the FPS, SoftICE obeys the tag bits and displays 'empty' if the tag bits specify that state.

When displaying in the Command window, SoftICE displays both the status word and the control word in ASCII format.

Example

The following example shows the use of the WF command with the -d option set to show the floating point stack, and the -f option set to display the stack in 10-byte real format.

```
WF -d f

    FPU Status Word: top=2
    FPU Control Word: PM UM OM ZM DM IM pc=3 rc=0
    ST0  1.619534411708533451e-289
    ST1  9.930182991407099205e-293
    ST2  6.779357630001165015e-296
    ST3  4.274541060856685014e-299
    ST4  2.782904336495237639e-302
    ST5  1.818657819582844735e-305
    ST6  empty
    ST7  empty
```

Note: ASCII flags are documented in the *INTEL Pentium Processor User's Manual*, "Architecture and Programming," Volume 3.

When displaying in any of the hexadecimal formats, SoftICE always display left to right from most significant to least significant. For example, in word format, the following order would be used:

```
bits(63-48) bits(47-32) bits(31-16) bits(15-0)
```

See Also

WC; WD; WL; WR; WS; WT; WW; WX

WHAT

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Determine if a name or expression is a “known” type.

Syntax

`WHAT` `[`***`name`***` | `***`expression`***`]`

name	Any symbolic name that cannot be evaluated as an expression.
expression	Any expression that can be interpreted as an expression.

Use

The WHAT command analyzes the parameter specified and compares it to known
names/values, enumerating each possible match, until no more matches can be found. Where appropriate, type identification of a match is expanded to indicate relevant information such as a related process or thread.

The *name* parameter is typically a collection of alphanumeric characters that represent the name of an object. For example, “Explorer” would be interpreted as a name, and might be identified as either a module, a process, or both.

The *expression* parameter is something that would not generally be considered a name. That is, it is a number, a complex expression (an expression which contains operators, such as Explorer + 0), or a register name. Although a register looks like a name, registers are special-cased as expressions because this usage is much more common. For example, for `WHAT eax`, the parameter eax is interpreted as an expression-type. Symbol names are treated as names, and will be correctly identified by the WHAT command as symbols.

Since the rules for determining name- and expression-types can be ambiguous at times, you can force a parameter to be evaluated as a name-type by placing it in quotes. For example, for `WHAT "eax"`, the quotes force eax to be interpreted as a name-type. To force a parameter that might be interpreted as a name-type to an expression-type, use the unary "+" operator. For example, for `WHAT +Explorer`, the presence of the unary "+" operator forces Explorer to be interpreted as a symbol, instead of a name.

Example

The following is an example of using the WHAT command on the name Explorer and the resulting output. From the output, you can see that the name Explorer was identified twice: once as a kernel process and once as a module.

```
WHAT explorer

The name (explorer) was identified and has the value FD854A80
   The value (FD854A80) is a Kernel Process (KPEB) for
Explorer(58)

The name (explorer) was identified and has the value 1000000
   The value (1000000) is a Module Image Base for 'Explorer'
```

WIDTH

OS

Windows 9x and the Windows NT family

Type

Customization

Definition

Set the number of display columns in the SoftICE window.

Syntax

WIDTH [*80-160*]

80 - 160	The number of display columns.

Use

When you are using SoftICE with the Universal Video Driver, you can use the WIDTH command can be used to set the number of display columns between 80 and 160. The default width is 80.

If you enter the WIDTH command without specifying a parameter, SoftICE displays the current setting of the window's width.

Example

The following example sets the width of the SoftICE window to 90 display columns.

```
WIDTH 90
```

The following command returns the current width setting of the SoftICE window.

```
WIDTH
```

See Also

LINES; SET

WINERROR

OS

Windows NT family

Type

System Information

Definition

Display header-defined mnemonics for Win32 error codes.

Syntax

WINERROR *code*

code	The Win32 error code you want a mnemonic returned for.

Use

The WINERROR command displays the header-defined mnemonic associated with a specific Win32/64 error code. This command allows you to return the more intuitive mnemonic associated with any Win32 error code.

Example

The following example shows the WINERROR command returning the mnemonic for the error code 0x103:

```
WINERROR 0x103
ERROR_NO_MORE_ITEMS
```

WL

OS

Windows 9x and the Windows NT family

Type

Window Control Command

Definition

Toggle the Locals window open or closed; and set the size of the Locals window.

Syntax

WL [+ | -] [***window-size***]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify the window-size, WL toggles the Locals window open or closed. If the Local window is closed, WL opens it; and if it is open, WL closes it.

If you specify the window-size, the Locals window is resized. If it is closed, WL opens it to the specified size.

When the Locals window is closed, the extra screen lines are added to the Command window. When the Locals window is opened, the lines are taken from the other windows in the following order: Command and Code.

Note: From within the Locals window, you can expand structures, arrays, and character strings to display their contents. Simply double-click the item you want to expand. Expandable items are indicated with a plus mark (+).

Example

If the Locals window is closed, the following example displays the window and sets it to twelve lines. If the Locals window is open, the example sets it to twelve lines.

```
WL 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WL +6
```

See Also

LOCALS; TYPES; WC; WD; WF; WR; WS; WT; WW; WX

WMSG

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

System Information

Definition

Display the names and message numbers of Windows messages.

Syntax

For Windows 3.1

WMSG [***partial-name***]

For Windows 9x and the Windows NT family

WMSG [***partial-name***| ***msg-number***]

partial-name	Windows message name or the first few characters of a Windows message name. If multiple Windows messages match the partial-name then all messages that start with the specified characters display.
msg-number	Hexadecimal message number of the message. Only the message that matches the msg-number displays.

Use

The following command displays the names and message numbers of Windows messages. It is useful when logging or setting breakpoints on Windows messages with the BMSG command.

Examples

The following example displays the names and message numbers of all Windows messages that start with "WM_GET".

```
WMSG wm_get*

    000D  WM_GETTEXT
    000E  WM_GETTEXTLENGTH
    0024  WM_GETMINMAXINFO
    0031  WM_GETFONT
    0087  WM_GETDLGCODE
```

The following example displays the Windows message that has the specified message number, 111.

```
WMSG 111

      0111 WM_Command
```

WR

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

F2

Definition

Toggle the Register window.

Syntax

WR

Use

The WR command makes the Register window visible if it is not currently visible. If the Register window is currently visible, WR closes the Register window.

The Register window displays the 80386 register set and the processor flags.

When the Register window is closed, the extra screen lines are added to the Command window.

When the Register window is made visible, the lines are taken from the other windows in the following order: Command, Code and Data.

For Windows 9x and the Windows NT family

The WR command also toggles the visibility of the floating point Register window if one is open.

See Also

WC; WD; WF; WL; WS; WT; WW; WX

WS

OS

Windows 9x and the Windows NT family

Type

Window Control

Key

ALT-S

Definition

Toggle the call stack window open or closed, and set the size of the stack window.

Syntax

WS [+ | -] [***window-size***]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	The number of lines in the SoftICE window assigned to the call stack window.

Use

You can use the arrow keys to select a particular call stack element. When you select a call stack item and press Enter, SoftICE updates the Locals and Code windows to show the selected stack level. You can also click your mouse in the Stack window to set focus, single-click an item to select it, and double-click an item to update the Locals and Code windows.

Example

The following command open the call stack window, if it is closed, and sets its size to twelve lines.

```
WS 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WS +6
```

See Also

WC; WD; WF; WL; WR; WT; WW; WX

WT

OS

Windows 9x

Type

Window Control

Key

Alt-T

Definition

Toggle the Thread window open or closed; set the size of the Thread window.

Syntax

WT [+ | -] [***window-size***]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify the window-size, WT toggles the window open or closed. If the Thread window is closed, WT opens it; if it is open, WT closes it.

If you specify the window-size, the Thread window is resized. If it is closed, WT opens it to the specified size.

The WT command displays information on threads for a given process. By using the ADDR commnad, you can switch to a different process context (thereby switching the viewable threads).

The information displayed for each thread is the same as displayed by the Thread command.

If you wish to move the cursor to the Thread window, use the Alt-T hotkey.

Example

If the Thread window is closed, the following example displays the window and sets it to twelve lines. If the Thread window is open, this example sets it to twelve lines.

```
WT 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WT +6
```

See Also

WC; WD; WF; WL; WR; WS; WX; THREAD(9x)

WT

OS

Windows NT family

Type

Window Control

Key

Alt-T

Definition

Toggle the Thread window open or closed; set the size of the Thread window.

Syntax

WT [*window-size*] [+ | -] [*window-size*]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify the window-size, WT toggles the window open or closed. If the Thread window is closed, WT opens it; if it is open, WT closes it. If you specify the window-size, the Thread window is resized. If it is closed, WT opens it to the specified size.

The WT command displays information on threads for a given process. By using the ADDR commnad, you can switch to a different process context (thereby switching the viewable threads). The information displayed for each thread includes the thread ID, KTEB, UTEB, state, process (ID #), and attributes. Information under the attributes can be any combination of the following:

*	Identifies the currently executing thread.
NP	Means that the thread's frame has been paged out (i.e., Not Present).
S	Means that the particular entry is selected and the Code,

Stack, and Locals windows are referring to that thread.

If you wish to move the cursor to the Thread window, use the Alt-T hotkey. By navigating into the Thread window and selecting one of the threads, the Stack, Code, and Locals windows will be updated to reflect the thread that is selected. If the selected thread's frame is paged out, the Stack, Code, and Locals windows will default to the currently executing thread.

Example

If the Thread window is closed, the following example displays the window and sets it to twelve lines. If the Thread window is open, this example sets it to twelve lines.

```
WT 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WT +6
```

See Also

WC; WD; WF; WL; WR; WS; WX; THREAD (NT)

WW

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Window Control

Key

Alt-F4

Definition

Toggle the Watch window open or closed, set the size of the Watch window.

Syntax

WW [***window-size***] **[+ | -]** [***window-size***]

+ | -	Optional switch to increase or decrease the window size by the decimal number referred to in *window-size*.
window-size	Decimal number.

Use

If you do not specify the window-size, WW toggles the Watch window open or closed. If the Watch window is closed, WW opens it; if it is open, WW closes it.

If you specify the window-size, the Watch window is resized. If it is closed, WW opens it to the specified size.

When the Watch window is closed, the extra screen lines are added to the Command window. When the Watch window is opened, the lines are taken from the other windows in the following order: Command, Code, and Data.

Example

If the Watch window is closed, the following example displays the window and sets it to twelve lines. If the Watch window is open, this example sets it to twelve lines.

```
WW 12
```

The following example expands the twelve-line code window (set in the previous example) to eighteen lines.

```
WW +6
```

See Also

WC; WD; WF; WL; WR; WS; WT; WX

WX

OS

Windows NT family

Type

Window Control

Definition

Toggle the XMM register window open or closed; set the display format of the window.

Syntax

WX [***SF/DF* | *D/Q/DQ* | ***]

SF	Signed real value.
DF	Double real value.
D	Display as 32-bit dword values.
Q	Display as 64-bit quadword values.
DQ	Display as 128-bit double quadword values.
*	Change to next format.

Use

On computers using the Pentium III CPU, you can use the WX command to display a window that contains the value of the XMM registers, XMM0 through XMM7. If you use the *SF* option, the register values are displayed as signed real values. If you use the *DF* option, the register values are displayed as double real values. If you use the *D* option the values are displayed as 32-bit dwords. If you use the *Q* option the values are displayed as 64-bit quadwords. If you use the *DQ* option the values are displayed as 128-bit double quadwords. You can use an asterisk (*) to change to the next format.

Example

The following example displays the XMM register window. The values are displayed as dwords.

```
WX d
```

See Also

WC; WD; WF; WL; WR; WS; WT; WW

X

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Flow Control

Key

F5

Definition

Exit from the SoftICE screen.

Syntax

x

Use

The X command exits SoftICE and restores control to the program that was interrupted to bring up SoftICE. The SoftICE screen disappears. If you had set any breakpoints, they become active.

Note: While in SoftICE, pressing the hot key sequence (default key Ctrl-D) or entering the G command without any parameters is equivalent to entering the X command.

XFRAME

OS

Windows 9x and the Windows NT family

Type

System Information

Definition

Display exception handler frames that are currently installed.

Syntax

XFRAME [***except-frame**** | ***thread-type***]

*except-frame**	Stack pointer value for an exception frame.
thread-type	Value that SoftICE recognizes as a thread.

Use

Exception frames are created by Microsoft's Structured Exception Handling API (SEH). Handlers are instantiated on the stack, so they are context specific.

When an exception handler is installed, information about it is recorded in the current stack frame. This information is referred to as an ExceptionRegistration. The XFRAME command understands this information, and walks backwards through stack frames until it reaches the top-most exception handler. From there it begins displaying each registration record up to the currently active scope. From each registration, it determines if the handler is active or inactive; its associated "global exception handler;" and, if the handler is active, the SEH type: try/except or try/finally. In the case of active exception handlers, it also displays the exception filter or finally handler address.

Note: The global exception handler is actually an exception dispatcher that uses information within an exception scope table to determine which, if any, exception handler handles the exception. It also handles other tasks such as global and local unwinds.

You can use the global exception handler, and try/except/finally addresses to trap SEH exceptions by setting breakpoints on appropriate handler addresses.

The XFRAME command is context-sensitive, so if you do not specify one of the optional parameters, SoftICE reverts to the context that was active at pop-up time and displays the exception frames for the current thread. When specifying an exception frame pointer as an optional parameter, make sure you are in a context in which the exception frame is valid. For thread-type parameters, SoftICE automatically switches to the correct context for the thread.

Below the information for the ExceptionRegistration record, XFRAME lists each active handler for the exception frame. For each active handler, XFRAME displays its type (try/except or try/finally), the address of its exception filter (for try/except only), and the address of the exception handler. Since exception handlers can be nested, more than one entry may be listed for each ExceptionRegistration record.

The XFRAME command displays bare addresses in its output. You can use either the STACK or WHAT commands to determine the API that installed an exception handler.

Do not confuse the xScope value with the nesting level of exception handlers. Although these values may appear to have some correlation, the value of xScope is simply an index into a scope table (xTable). The scope table entry contains a link to its parent scope (if any).

In the event that a stack frame is not present, the XFRAME will not be able to complete the stack walk.

Output

For each exception frame that is installed, XFRAME displays the following information:

xFrame	Address of the ExceptionRegistration. This value is stack based.
xHandler	Address of the global exception handler which dispatches the exception to the appropriate try/except/finally filter/handler.
xTable	Address of the scope table used by the global exception handler to dispatch exceptions.
xScope	Index into the xTable for the currently active exception handler. If this value is -1, the exception handler is installed, but is inactive and will not trap an exception.

Example

The following example illustrates the use of the XFRAME command to display information about the exception handler frames for the currently active thread:

```
XFRAME


xFrame    xHandler   xTable     xScope
------    --------   ------     ------
0x45FFFD  0x6063963  0x606018B  00
C         8          8
          try/except (0000) filter=0x60606F72,
          handler=0x60606F85
0x45FFFA  0x5FE1689  0x5FE1121  00
8         0          0
          try/except (0000) filter=0x5FE125EB,
          handler=0x5FE125F8
0x45FFB7  0x77F8B1B  0x77F6137  00
4         C          0
          try/except (0000) filter=0x77F7DD21,
          handler=0x77F7DD31
```

XG

OS

Windows 3.1, Windows 9x

Type

Symbol/Source

Definition

Go to an address in trace simulation mode.

Syntax

XG [**r**] ***address***

r	Reverse. Go backwards in the back trace history buffer.

Use

XG does a Go to a specific code address within the back trace history buffer. This command can only be used in trace simulation mode. The R parameter makes XG go backwards within the back trace history buffer. If the specified address is not found within the back trace history buffer, an error displays.

Example

The following example makes the instruction at address CS:2FF000h the current instruction in the back trace history buffer.

```
XG 2ff000
```

XP

OS

Windows 3.1, Windows 9x

Type

Symbol/Source

Key

Ctrl-F10

Definition

Program step in trace simulation mode.

Syntax

XP

Use

The XP command does a program step of the current instruction in the back trace history buffer. It can only be used in trace simulation mode. Use this command to skip over calls to procedures and rep string instructions.

Example

The following example does a program step over the current instruction in the back trace history buffer.

```
XP
```

XRSET

OS

Windows 3.1, Windows 9x

Type

Symbol/Source Command

Definition

Reset the back trace history buffer.

Syntax

XRSET

Use

XRSET clears all information from the back trace history buffer. It can only be used when NOT in trace simulation mode.

Example

The following example clears the back trace history buffer.

```
XRSET
```

XT

OS

Windows 3.1, Windows 9x

Type

Symbol/Source Command

Key

Ctrl-F8 (XT R: Alt-F8)

Definition

Single step in trace simulation mode.

Syntax

XT [R]

R	Reverse. Step backwards in Beatrice history buffer.

Use

Use the XT command to single step the current instruction in the back trace history buffer. You can only use the XT command in trace simulation mode. This command steps to the next instruction contained in the back trace history buffer. The command XT R single steps backwards within the back trace history buffer.

Example

The following example single steps one instruction forward in the back trace history buffer.

```
XT
```

ZAP

OS

Windows 3.1, Windows 9x, and the Windows NT family

Type

Mode Control Command

Definition

Replace an embedded interrupt 1 or 3 with a NOP instruction.

Syntax

ZAP

Use

The ZAP command replaces an embedded interrupt 1 or 3 with the appropriate number of NOP instructions. This is useful when the INT 1 or INT 3 is placed in code that is repeatedly executed, and you no longer want SoftICE to pop up. This command works only if the INT 1 or INT 3 instruction is the instruction before the current CS:EIP.

Example

The following example replaces the embedded interrupt 1 or interrupt 3 with a NOP instruction.

```
ZAP
```

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