SoftICE™
Command Reference

Windows NT™
Windows® 98
Windows® 95
Windows® 3.1
DOS
July 1998

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Contents

.  2
?  3
A  4
ACTION  6
ADDR  7
ADDR  10
ALTKEY  12
ALTSCR  13
ANSWER  14
BC  16
BD  17
BE  18
BH  19
BL  21
BMSG  22
BPE  24
BPINT  25
BPINT  27
BPIO  29
BPM  32
BPR  36
BPRW  39
BPT  41
BPX  42
BSTAT  45
C  47
CLASS  48
CLS  51
CODE  52
COLOR  53
CPU  55
CR  58
CSIP  59
D  61
DATA  63
DEVICE  64
DEX  66
DIAL  67
DRIVER  69
E  71
EC  73
EXIT  74
EXP  75
F  78
FAULTS  79
FIBER  80
FILE  81
FKEY  82
FOBJ  84
FLASH  86
FORMAT  87
G  88
GDT  89
GENINT  91
H  92
HBOOT  93
HEAP  94
HEAP32  97
HEAP32  100
HERE  105
HWND  106
HWND  109
I  113
I1HERE  114
I3HERE  115
IDT  116
IRP  118
LDT  121
LHEAP  123
LINES  125
LOCALS  126
M  127
MACRO  128
MAP32  132
MAPV86  135
Contents

<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOD</td>
<td>137</td>
</tr>
<tr>
<td>MOD</td>
<td>139</td>
</tr>
<tr>
<td>NTCALL</td>
<td>142</td>
</tr>
<tr>
<td>O</td>
<td>144</td>
</tr>
<tr>
<td>OBJDIR</td>
<td>145</td>
</tr>
<tr>
<td>OBJTAB</td>
<td>147</td>
</tr>
<tr>
<td>P</td>
<td>149</td>
</tr>
<tr>
<td>PAGE</td>
<td>150</td>
</tr>
<tr>
<td>PAUSE</td>
<td>155</td>
</tr>
<tr>
<td>PCI</td>
<td>156</td>
</tr>
<tr>
<td>PEEK</td>
<td>157</td>
</tr>
<tr>
<td>PHYS</td>
<td>158</td>
</tr>
<tr>
<td>POKE</td>
<td>159</td>
</tr>
<tr>
<td>Print Screen Key</td>
<td>160</td>
</tr>
<tr>
<td>PRN</td>
<td>161</td>
</tr>
<tr>
<td>PROC</td>
<td>162</td>
</tr>
<tr>
<td>QUERY</td>
<td>168</td>
</tr>
<tr>
<td>R</td>
<td>173</td>
</tr>
<tr>
<td>RS</td>
<td>175</td>
</tr>
<tr>
<td>S</td>
<td>176</td>
</tr>
<tr>
<td>SERIAL</td>
<td>178</td>
</tr>
<tr>
<td>SET</td>
<td>181</td>
</tr>
<tr>
<td>SHOW</td>
<td>183</td>
</tr>
<tr>
<td>SRC</td>
<td>184</td>
</tr>
<tr>
<td>SS</td>
<td>185</td>
</tr>
<tr>
<td>STACK</td>
<td>186</td>
</tr>
<tr>
<td>SYM</td>
<td>189</td>
</tr>
<tr>
<td>SYMLOC</td>
<td>191</td>
</tr>
<tr>
<td>T</td>
<td>193</td>
</tr>
<tr>
<td>TABLE</td>
<td>194</td>
</tr>
<tr>
<td>TABS</td>
<td>196</td>
</tr>
<tr>
<td>TASK</td>
<td>197</td>
</tr>
<tr>
<td>THREAD</td>
<td>199</td>
</tr>
<tr>
<td>THREAD</td>
<td>201</td>
</tr>
<tr>
<td>TRACE</td>
<td>204</td>
</tr>
<tr>
<td>TSS</td>
<td>205</td>
</tr>
<tr>
<td>TYPES</td>
<td>207</td>
</tr>
<tr>
<td>U</td>
<td>208</td>
</tr>
<tr>
<td>VCALL</td>
<td>210</td>
</tr>
<tr>
<td>VER</td>
<td>212</td>
</tr>
<tr>
<td>VM</td>
<td>213</td>
</tr>
<tr>
<td>VXD</td>
<td>216</td>
</tr>
<tr>
<td>VXD</td>
<td>218</td>
</tr>
<tr>
<td>WATCH</td>
<td>220</td>
</tr>
<tr>
<td>WC</td>
<td>222</td>
</tr>
<tr>
<td>WD</td>
<td>223</td>
</tr>
<tr>
<td>WF</td>
<td>224</td>
</tr>
<tr>
<td>WHAT</td>
<td>226</td>
</tr>
<tr>
<td>WL</td>
<td>227</td>
</tr>
<tr>
<td>WMSG</td>
<td>228</td>
</tr>
<tr>
<td>WR</td>
<td>229</td>
</tr>
<tr>
<td>WW</td>
<td>230</td>
</tr>
<tr>
<td>X</td>
<td>231</td>
</tr>
<tr>
<td>XFRAME</td>
<td>232</td>
</tr>
<tr>
<td>XG</td>
<td>234</td>
</tr>
<tr>
<td>XP</td>
<td>235</td>
</tr>
<tr>
<td>XRSET</td>
<td>236</td>
</tr>
<tr>
<td>XT</td>
<td>237</td>
</tr>
<tr>
<td>ZAP</td>
<td>238</td>
</tr>
</tbody>
</table>
The *SoftICE Command Reference* is for use with the following operating systems:

- Windows 3.1
- Windows 98
- Windows 95
- Windows NT

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

**OBJDIR**

Displays objects in a Windows NT Object Manager’s object directory.

**Syntax**

OBJDIR [object-directory-name]

**Use**

Use the OBJDIR command to display named objects within the Object Manager’s object directory. Using OBJDIR with no parameters displays the named objects within the root object directory.

**Output**

The OBJDIR command displays the following information:

- **Object**: Address of the object body
- **ObjHdr**: Address of the object header
- **Name**: Name of the object
- **Type**: Windows NT-defined data type of the object

**Example**

Abbreviated sample output of the OBJDIR command listing objects in the Device object directory follows:

```
OBJDIR device
Directory of \Device at FD8E7F30
```

<table>
<thead>
<tr>
<th>Object</th>
<th>ObjHdr</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD8CC750</td>
<td>FD8CC728</td>
<td>Beep</td>
<td>Device</td>
</tr>
<tr>
<td>FD89A030</td>
<td>FD89A008</td>
<td>NwlnkIpx</td>
<td>Device</td>
</tr>
<tr>
<td>FD889150</td>
<td>FD889128</td>
<td>Netbios</td>
<td>Device</td>
</tr>
</tbody>
</table>

**See Also**

OBJTAB

---

You will find it a very good practice always to verify your references, sir!

Dr. Routh
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 95 and Windows NT**

The command switches contexts back to the original context that SoftICE popped up in.
Evaluate an expression.

**Syntax**

**For Windows 3.1**

? [command | expression]

**For Windows 95 and Windows NT**

? 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 95 and Windows NT**

Under Windows 95 and Windows NT, the ? command only evaluates expressions. (Refer to H on page 92 for information about getting help under Windows 95 and Windows NT.)

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
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 95 and Windows NT: 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.
- Mnemonic followed by a list of bytes and/or quoted strings separated by spaces or commas.
- RETF mnemonic represents a far return.
- Use WORD PTR, BYTE PTR, DWORD PTR, and FWORD PTR to determine data size, if there is no register argument.
  
  *Example:* 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.

  *Example:* MOV AX, [1234]

---

4 SoftICE Command Reference
For Windows NT

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 Windows NT, flush the memory image from the cache, or modify the module.

Example

When you use the following command:

A CS:1234

the assembler prompts you for assembly instructions. Enter all instructions and press Enter at the address prompt. The assembler assembles the instructions beginning at offset 1234h within the current code segment.
ACTION

Windows 3.1

Mode Control

Set action after breakpoint is reached.

**Syntax**

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

- `interrupt-number`: Valid interrupt number between 0 and 5Fh.
- `debugger-name`: Module name of the Windows application debugger to gain control of on a SoftICE breakpoint.

**Use**

The ACTION command determines where to give control when breakpoint conditions are met. In most cases, you can 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 95 and Windows NT.

**Example**

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

<table>
<thead>
<tr>
<th>Product</th>
<th>SoftICE Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>CodeView for DOS</td>
<td>ACTION nmi</td>
</tr>
<tr>
<td>Note: SoftICE generates a non-maskable interrupt when break conditions are met. This gives control to CodeView for DOS.</td>
<td></td>
</tr>
<tr>
<td>CodeView for Windows</td>
<td>ACTION cvw</td>
</tr>
<tr>
<td>Borland’s Turbo Debugger for Windows</td>
<td>ACTION tdw</td>
</tr>
<tr>
<td>Multiscope’s Debugger for Windows</td>
<td>ACTION rtd</td>
</tr>
</tbody>
</table>

**See Also**

Refer to setting breakpoints in *Using SoftICE*.
ADDR

Display or switch to address context.

**Syntax**

\[
\text{ADDR \ [\text{context-handle} \mid \text{process-name}]}
\]

- **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.

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 the same way as Windows does.

When switching address contexts, Windows 95 copies all entries in the new context’s PGTPTR array to the page directory (pointed at 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 bepaged 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 that SoftICE popped up in. 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

<table>
<thead>
<tr>
<th>Handle</th>
<th>PGTPTR</th>
<th>Tables</th>
<th>Min Addr</th>
<th>Max Addr</th>
<th>Mutex</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1068D00</td>
<td>C106CD0C</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFD000</td>
<td>C0FEC770</td>
<td>WINWORD</td>
</tr>
<tr>
<td>C104E214</td>
<td>C1068068</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFD000</td>
<td>C1063DBC</td>
<td>Rundll32</td>
</tr>
<tr>
<td>C105AC9C</td>
<td>C0FE5330</td>
<td>0002</td>
<td>00400000</td>
<td>7FFFD000</td>
<td>C0FE5900</td>
<td>QUICKRES</td>
</tr>
<tr>
<td>C1055EF8</td>
<td>C105CE8C</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFD000</td>
<td>C105C5EC</td>
<td>Ibserver</td>
</tr>
<tr>
<td>C1056D10</td>
<td>C10571D4</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFD000</td>
<td>C1056D44</td>
<td>Mprexe</td>
</tr>
</tbody>
</table>

The current context is highlighted.
### SoftICE Commands

<table>
<thead>
<tr>
<th>Handle</th>
<th>PGPTR</th>
<th>Tables</th>
<th>Min Addr</th>
<th>Max Addr</th>
<th>Mutex</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>C10D900C</td>
<td>C10D9024</td>
<td>0002</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C10D9050</td>
<td></td>
</tr>
<tr>
<td>C10493E8</td>
<td>C10555FC</td>
<td>0004</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C0FE6460</td>
<td>KERNEL32</td>
</tr>
<tr>
<td>C1055808</td>
<td>C105650C</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C105583C</td>
<td>MSGSRV32</td>
</tr>
<tr>
<td>C10593CC</td>
<td>C1059B78</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C105908C</td>
<td>Explorer</td>
</tr>
<tr>
<td>C106AE70</td>
<td>C106DD10</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C10586F0</td>
<td>Exchng32</td>
</tr>
<tr>
<td>C106ABC4</td>
<td>C106ED04</td>
<td>0200</td>
<td>00400000</td>
<td>7FFFF000</td>
<td>C106CA4C</td>
<td>Mapisp32</td>
</tr>
</tbody>
</table>

**See Also** For Windows NT, refer to `ADDR` on page 10.
SoftICE Commands

ADDR

Display or switch to an address context.

Syntax

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

KPEB                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.

To use ADDR with
Windows 95, refer to
ADDR on page 7.

If you switch to an address context that contains an 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 Windows NT.

Under low memory conditions, Windows NT starts swapping data to disk, including inactive
processes, parts of the page directory, and page tables. When this occurs, SoftICE may not be
able 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, the following information is shown:

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 Windows NT
processes that have an LDT use the same LDT selector. For process
switches, Windows NT 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
```

<table>
<thead>
<tr>
<th>CR3</th>
<th>LDT Base:Limit</th>
<th>KPEB</th>
<th>PID</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>00030000</td>
<td></td>
<td>FD8EA920</td>
<td>0002</td>
<td>System</td>
</tr>
<tr>
<td>011FB000</td>
<td></td>
<td>FD8CD880</td>
<td>0013</td>
<td>smss</td>
</tr>
<tr>
<td>017A5000</td>
<td></td>
<td>FD8BF860</td>
<td>0016</td>
<td>cssrs</td>
</tr>
<tr>
<td>01B69000</td>
<td></td>
<td>FD8BFADE0</td>
<td>001</td>
<td>winlogon</td>
</tr>
<tr>
<td>01CF3000</td>
<td></td>
<td>FD8B6B40</td>
<td>0027</td>
<td>services</td>
</tr>
<tr>
<td>01D37000</td>
<td>FD8B5760</td>
<td>0029</td>
<td></td>
<td>lsass</td>
</tr>
<tr>
<td>00FFA000</td>
<td>FD8AABE0</td>
<td>0040</td>
<td></td>
<td>spoolss</td>
</tr>
<tr>
<td>009A5000</td>
<td>FD8F7E0</td>
<td>002B</td>
<td></td>
<td>nddeagnt</td>
</tr>
<tr>
<td>00AA5000</td>
<td>FD89C40</td>
<td>004A</td>
<td></td>
<td>progman</td>
</tr>
<tr>
<td>006D2000</td>
<td>E115F000:FFEF</td>
<td>FD89DE0</td>
<td>0054</td>
<td>ntvdm</td>
</tr>
<tr>
<td>00837000</td>
<td>FD89DE80</td>
<td>0059</td>
<td></td>
<td>CLOCK</td>
</tr>
<tr>
<td>00C8C000</td>
<td>FD89C020</td>
<td>0046</td>
<td></td>
<td>scm</td>
</tr>
<tr>
<td>00387000</td>
<td>FD89E5E0</td>
<td>004E</td>
<td></td>
<td>4NT</td>
</tr>
<tr>
<td>*0121C000</td>
<td>E1172000:0187</td>
<td>FD88C5A0</td>
<td>0037</td>
<td>ntvdm</td>
</tr>
<tr>
<td>00030000</td>
<td></td>
<td>8013DD50</td>
<td>0000</td>
<td>Idle</td>
</tr>
</tbody>
</table>

### See Also

For Windows 95, refer to ADDR on page 7.

PROC
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 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 pop up the SoftICE screen, use the following command:

```
ALTKEY alt z
```
ALTSCR

Display SoftICE on an alternate screen.

**Syntax**

`ALTSCR [on | off]`

**Use**

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

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

The default setting is ALTSCR mode OFF.

*Hint*: 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 8, “Customizing SoftICE” in the *Using SoftICE* guide.

In the SoftICE program group, use Video Setup to select the monochrome monitor. SoftICE automatically starts out 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.

**For Windows 95**

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

**Example**

To redirect screen output to the alternate monitor, use the following command:

`ALTSCR on`
**ANSWER**

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, 57000, 115000.
- **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 8, “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 38400bps.

```
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
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 command:

```
BC 1 5
```

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

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 command:

```
BD 1 3
```
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 command:

```
BE 3
```
BH

List and/or 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 95**

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 95**

If you choose to configure Windows 95 to load SoftICE before WIN.COM by appending \siw95\winice.exe to the end of your AUTOEXEC.BAT, Windows 95 does not return control to SoftICE when it shuts down unless you set the BootGUI option in MSDOS.SYS to BootGUI=0. If this option is set to BootGUI=1, SoftICE does not save the break-point history file. Refer to Chapter 2, “Installing SoftICE,” in the *Using SoftICE* manual for more information about configuring when SoftICE loads.

**For Windows NT**

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 command:

\[ BH \]
BL

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 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 95 and Windows NT

  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

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 95 and Windows NT
BMSG window-handle [L] [begin-msg [end-msg]] [IF expression]
[DO "command1;command2;..."]

window-handle HWND value returned from CreateWindow or CreateWindowEx.

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.

L Logs messages to the SoftICE Command window.

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
Use

The BMSG command is used to set breakpoints on a window’s message handler that will trigger when they receive 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 on 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 may set multiple BMSG breakpoints on one window-handle, although 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 (which 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 the breakpoint information to be logged to the SoftICE Command window, instead of having SoftICE pop up when the breakpoint is triggered. The message range that the breakpoint triggers on includes any message with a type value less than or equal to WM_CREATE. Output from this breakpoint being triggered can be viewed by popsing into SoftICE and scrolling through the command buffer.

:BMSG f4c L 0 wm_create
BPE

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.

Warning: 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.

Conditional expressions and breakpoint actions are expanded as parts 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, press the Enter key. To clear the breakpoint, press the Escape key.
BPINT

Set a breakpoint on an interrupt.

Syntax

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

int-number

Interrupt number from 0 - 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 at the time that the interrupt or exception occurs matches the specified value. 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, regardless of the value of the AX register at the time.

For Windows 95 and Windows NT, refer to BPINT on page 27.

Example: IRQ0 is INT50h and IRQ8 is INT58h.

If a BPINT goes off due to a software interrupt instruction in a DOS VM, control will be transferred to the Windows protected mode interrupt handler for protection faults, which eventually call down to the appropriate DOS VM’s interrupt handler (pointed at 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 will point at the INT instruction in the DOS VM.

\texttt{BPINT 21 ah=4c}

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

\texttt{BPINT 50}

See Also

For Windows 95 and Windows NT, refer to \textit{BPINT} on page 27.
BPINT

Set a breakpoint on an interrupt.

Syntax

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

- `int-number`: Interrupt number from 0 - 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 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 BPINT command to pop up SoftICE whenever a specified processor exception, hardware interrupt, or software interrupt occurs. The IF option allows arbitrary filtering of interrupts that result in breakpoints. The DO option provides the ability to associate SoftICE commands with interrupts such that they 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 will point at the first instruction of the interrupt or exception handler routine pointed at by the IDT. If a software interrupt triggers the breakpoint, the instruction pointer (CS:EIP) will point at the INT instruction that caused the breakpoint.

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

For Windows 3.1, refer to BPINT on page 25.

If a software interrupt occurs in a DOS VM, control is transferred to a Windows protected mode interrupt handler, which eventually calls down to the DOS VM’s interrupt handler (pointed at 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 95

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 Windows NT

Windows NT 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 system call (software interrupt 2Eh) breakpoints 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 25.
BPIO

Set a breakpoint on an I/O port access.

Syntax

For Windows 3.1

\[\text{BPIO } \text{port} \ [\text{verb}] \ [\text{qualifier value}] \ [c=\text{count}]\]

For Windows 95

\[\text{BPIO } [-h] \ \text{port} \ [\text{verb}] \ [\text{IF expression}] \ [\text{DO } \text{"command1;command2;..."} ]\]

For Windows NT

\[\text{BPIO } \text{port} \ [\text{verb}] \ [\text{IF expression}] \ [\text{DO } \text{"command1;command2;..."} ]\]

\begin{itemize}
  \item \textit{port} \ Byte or word value.
  \item \textit{verb} \ \begin{tabular}{|c|l|}
    \hline
    Value & Description \\
    \hline
    R & Read (IN) \\
    W & Write (OUT) \\
    RW & Reads and Writes \\
    \hline
  \end{tabular}
  \item \textit{qualifier} \ \begin{tabular}{|c|l|}
    \hline
    Value & Description \\
    \hline
    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. X's are don't-care bits. \\
    \hline
  \end{tabular}
  \item \textit{value} \ Byte, word, or dword value.
  \item \textit{c=} \ Breakpoint trigger count.
\end{itemize}

\textit{Qualifier, value, and c=} are not valid for Windows 95 and Windows NT.
SoftICE Commands

**-h**
Use hardware debug registers to set a breakpoint in VxD. Available for Pentium-class processors on Windows 95 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, the value specified is compared with, according to the verb, the actual data value read or written by the IN or OUT instruction causing the breakpoint. The value may be a byte, a word, or a dword. The possible verbs allow for comparisons of equality, inequality, greater-than-or-equal, less-than-or-equal, and logical AND comparison.

**For Windows 3.1 and Windows 95**
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 VMM are not trapped by BPIO breakpoints. For Windows 95 only, 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. The command shows each hooked I/O port plus 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 on the address of the I/O handler.
For Windows NT

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 95 (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 this command: `BPIO 21 w ne ff`

- For Windows 95 and Windows NT
  Use this command: `BPIO 21 w if (al!=0xFF)`

  **Note:** In the Windows NT 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 this command: `BPIO 3fe r eq m 11xx xxxx`

- For Windows 95 and Windows NT
  Use this command: `BPIO 3fe r if ((al & 0xC0)==0xC0)`
BPM

Set a breakpoint on memory access or execution.

Syntax

For Windows 3.1

\[ \text{BPM[size] address [verb] [qualifier value] [debug-reg] [c=count]} \]

For Windows 95 and Windows NT

\[ \text{BPM[size] address [verb] [debug-reg] [IF expression]} \]
\[ \text{[DO "command1;command2;..."]} \]

**size**

Size is actually a 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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
</tr>
<tr>
<td>D</td>
<td>Double Word</td>
</tr>
</tbody>
</table>

**verb**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Read</td>
</tr>
<tr>
<td>W</td>
<td>Write</td>
</tr>
<tr>
<td>RW</td>
<td>Reads and Writes</td>
</tr>
<tr>
<td>X</td>
<td>Execute</td>
</tr>
</tbody>
</table>
**SoftICE Commands**

**Qualifier**

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

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ</td>
<td>Equal</td>
</tr>
<tr>
<td>NE</td>
<td>Not Equal</td>
</tr>
<tr>
<td>GT</td>
<td>Greater Than</td>
</tr>
<tr>
<td>LT</td>
<td>Less Than</td>
</tr>
<tr>
<td>M</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Value**

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

**Debug-reg**

<table>
<thead>
<tr>
<th>Value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DR0</td>
<td></td>
</tr>
<tr>
<td>DR1</td>
<td></td>
</tr>
<tr>
<td>DR2</td>
<td></td>
</tr>
<tr>
<td>DR3</td>
<td></td>
</tr>
</tbody>
</table>

**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**

Use BPM breakpoints to have SoftICE pop up whenever certain types of accesses are made to memory locations. The size and verb parameters allow for the accesses to be filtered according to their type, and the DO parameter (Windows NT only) allows for arbitrary SoftICE commands to be executed 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 a 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. The CS:EIP points at the instruction in the code stream following the trapped instruction. In the case of the X verb, SoftICE pops up before the instruction causing the breakpoint to trigger has executed. The CS:EIP therefore points at 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 the verb is R, W or RW, executing an instruction at the specified address does not cause the breakpoint to occur.

If you set a breakpoint using BPMW it is a word-sized memory breakpoint, then the specified address must start on a word boundary. If you set a breakpoint using BPMD the memory breakpoint is dword sized, then the specified address must start on a double word boundary.

**For Windows 3.1**

The count parameter can be used to have a breakpoint trigger 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 95**

BPM breakpoints set in the range 400000 - 7FFFFFFF (WIN32 applications) are address-context sensitive. That is, they 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 Windows NT**

Any breakpoint set on an address below 80000000h (2 GB) is address-context sensitive. This includes WIN32 and DOS V86 applications. Take care to ensure you are in the correct context before setting a breakpoint.
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 command: \texttt{BPM es:di+1f w eq 10}

- For Windows 95 and Windows NT
  Use the command: \texttt{BPM es:di+1f w if \((\ast(es:di+1f)==0x10)\)}

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 95, and Windows NT
  Use the command: \texttt{BPM CS:80204D20 x}

The following example defines a word breakpoint on a memory write. The breakpoint occurs the first time that location \texttt{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 command: \texttt{BPMW foo e eq m 0xxx xxxx xxxx xxxx 1}

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 command: \texttt{BPM ds:80150000 w gt 5}

- For Windows 95 and Windows NT
  Use the command: \texttt{BPM ds:80150000 if (byte(*ds:80150000)>5)}
BPR

Set a breakpoint on a memory range.

Syntax

**For Windows 3.1**

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

**For Windows 95**

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

<table>
<thead>
<tr>
<th>start-address</th>
<th>Beginning of memory range.</th>
</tr>
</thead>
<tbody>
<tr>
<td>end-address</td>
<td>Ending of memory range.</td>
</tr>
<tr>
<td>verb</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Read</td>
</tr>
<tr>
<td>W</td>
<td>Write</td>
</tr>
<tr>
<td>RW</td>
<td>Reads and Writes</td>
</tr>
<tr>
<td>T</td>
<td>Back Trace on Execution</td>
</tr>
<tr>
<td>TW</td>
<td>Back Trace on Memory Writes</td>
</tr>
</tbody>
</table>

**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

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, execution breakpoints on ranges can be obtained with the R verb. 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 result in information about all instructions that would have caused the breakpoint to trigger to be written 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 at the instruction that caused the breakpoint.

Range breakpoints are always set in the page tables that are active when the BPR command is entered. 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, GDT, IDTs, LDT, and SoftICE. 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 cannot place a range breakpoint, but if you do SoftICE will not complain. 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 have a breakpoint trigger 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 95

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

Set range breakpoints on Windows program or code segment.

Syntax

For Windows 3.1

BPRW module-name | selector | verb

For Windows 95

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 BPR style breakpoints. 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 95

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 to do the following:

- 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. This works because the R verb breaks on execution as well as reads.
- 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

This 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

Use a breakpoint description as a template.

**Syntax**

\[ \text{BPT} \ \text{breakpoint-index} \]

`breakpoint-index`       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 breakpoint referenced by breakpoint index is not altered. This command offers a quick way to modify the parameters of an existing breakpoint.

Conditional expressions are expanded as parts of the breakpoint expression as well as 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 follows:

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

Press Enter to add the new breakpoint.
Set or clear a breakpoint on execution.

**Syntax**

For Windows 3.1

BPX [address] [c=count]

For Windows 95 and Windows NT

BPX [address] [IF expression] [DO "command1;command2;..."]

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

The address parameter must point at the first byte of the instruction opcode of the instruction where the breakpoint is being set. 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 where the implied address is that 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 (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.

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

SoftICE supports a maximum of 256 breakpoints when using this command.

### For Windows 3.1 and Windows 95

BPX breakpoints in DOS VMs are tied to the VM they were set in. 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 go off 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 95

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 Windows NT

Any breakpoint set on an address below 80000000h (2 GB) is address-context sensitive. This includes WIN32, WIN16, and DOS V86 applications. Take care to ensure you are in the correct context before setting a breakpoint.
SoftICE Commands

**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 81).

```
BPX .1234
```

**For Windows 95 and Windows NT**

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 will be displayed in the Data window.

```
BPX 80023455 do "db ds:dx"
```

**See Also**

*FILE*
BSTAT

Display statistics for one or more breakpoints.

Syntax

BSTAT [breakpoint-index]

breakpoint-index Breakpoint index number.

Use

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

Because conditional expressions are evaluated when the breakpoint is triggered, it is possible to have evaluation run-time errors. Examples of this are when a virtual symbol is referenced, and that symbol has not been loaded, or a reference to symbol cannot be resolved because the memory is not present. In these cases, and possibly others, an error will be generated and noted. The Status and Scode fields under the Misc. column contain error information which indicates what problem, if any, has occurred.

Output

For each breakpoint displayed the following information also appears:

- **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 and/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

<table>
<thead>
<tr>
<th>BP #</th>
<th>*00</th>
</tr>
</thead>
</table>

**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.*
Compare two data blocks.

**Syntax**

C start-address l length start-address-2

- **start-address**: Start of first memory range.
- **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, both bytes display, along with 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

Display information on Window classes.

Syntax

For Windows 3.1
CLASS [module-name]

For Windows 95
CLASS [-x] [task-name]

For Windows NT
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 95 or Windows NT 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.

Use

For Windows 95

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 Windows NT**

The architecture of class information under Windows NT is similar to that of Windows 95 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 superclassing a registered window class is implemented.

Under Windows NT, 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 window's instance data. Any changes to the instanced class data do 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 registers by the MSWORD module.

```
:CLASS msword
```

<table>
<thead>
<tr>
<th>Handle</th>
<th>Name</th>
<th>Owner</th>
<th>Window Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0F24</td>
<td>#32772</td>
<td>USER</td>
<td>TITLEWNDPROC</td>
</tr>
<tr>
<td>0EFC</td>
<td>#32771</td>
<td>USER</td>
<td>SWITCHWNDPROC</td>
</tr>
<tr>
<td>0ED4</td>
<td>#32769</td>
<td>USER</td>
<td>DESKTOPWNDPROC</td>
</tr>
<tr>
<td>0E18</td>
<td>MDIClient</td>
<td>USER</td>
<td>MDICLNTWNDPROC</td>
</tr>
<tr>
<td>0DDC</td>
<td>ComboBox</td>
<td>USER</td>
<td>COMBOBXWNDPROC</td>
</tr>
<tr>
<td>0DA0</td>
<td>ComboLBox</td>
<td>USER</td>
<td>LBOXCTLWNDPROC</td>
</tr>
<tr>
<td>0D64</td>
<td>ScrollBar</td>
<td>USER</td>
<td>SBWNDPROC</td>
</tr>
<tr>
<td>0D28</td>
<td>ListBox</td>
<td>USER</td>
<td>LBOXCTLWNDPROC</td>
</tr>
<tr>
<td>0CF0</td>
<td>Edit</td>
<td>USER</td>
<td>EDITWNDPROC</td>
</tr>
</tbody>
</table>

*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

Clear the Command window.

Syntax

CLS

Use

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

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.
- CODE with no parameters displays 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.

```bash
CODE on
```

**See Also**

SET
COLOR

Display or set the screen colors.

Syntax

COLOR [normal bold reverse help line]

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.

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
where there are 16 foreground colors and 8 background colors.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>black</td>
<td>A</td>
<td>light green</td>
</tr>
<tr>
<td>1</td>
<td>blue</td>
<td>B</td>
<td>light cyan</td>
</tr>
<tr>
<td>2</td>
<td>green</td>
<td>C</td>
<td>light red</td>
</tr>
<tr>
<td>3</td>
<td>cyan</td>
<td>D</td>
<td>light magenta</td>
</tr>
<tr>
<td>4</td>
<td>red</td>
<td>E</td>
<td>yellow</td>
</tr>
<tr>
<td>5</td>
<td>magenta</td>
<td>F</td>
<td>white</td>
</tr>
</tbody>
</table>
### Example

This command causes the following color assignments:

```plaintext
COLOR 7 e 71 30 2
```

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>brown</td>
</tr>
<tr>
<td>7</td>
<td>grey</td>
</tr>
<tr>
<td>8</td>
<td>dark grey</td>
</tr>
<tr>
<td>9</td>
<td>light blue</td>
</tr>
</tbody>
</table>

- 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
CPU

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 Windows NT

If your PC contains a multi-processor mother board that uses an I/O APIC as an interrupt controller, the CPU command displays the CPU local and I/O APICS.

Example

The following example lists the sample output from the CPU command under Windows 95 or Windows NT 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 Windows NT on a system that uses an I/O APIC:

Processor 00 Registers
----------------------
CS:EIP=0008:8013D7AE   SS:ESP=0010:8014AB7C
EAX=00000041   EBX=FFDF0000   ECX=00000041   EDX=80010031
ESI=80147940   EDI=80147740   EBP=FFDF6000   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 Windows NT on a system that uses an I/O APIC:

<table>
<thead>
<tr>
<th>Inti</th>
<th>Vector</th>
<th>Delivery</th>
<th>Status</th>
<th>Trigger</th>
<th>Dest Mode</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>91</td>
<td>Low. Pri</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
<tr>
<td>03</td>
<td>61</td>
<td>Low. Pri</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
<tr>
<td>04</td>
<td>71</td>
<td>Low. Pri</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
<tr>
<td>08</td>
<td>D1</td>
<td>Fixed</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
<tr>
<td>0C</td>
<td>81</td>
<td>Low. Pri</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
<tr>
<td>0E</td>
<td>B1</td>
<td>Low. Pri</td>
<td>Idle</td>
<td>Edge</td>
<td>Logical</td>
<td>01000000</td>
</tr>
</tbody>
</table>

I/O unit id register: 0E000000
I/O unit version register: 000F0011

See Also

PAGE
SoftICE Commands

CR

Windows 3.1 System Information

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 PAGE on page 150).

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

Windows 3.1

Set CS:EIP (instruction pointer) memory range qualifier for all breakpoints (for 16-bit programs only).

Syntax

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

off       Turns off CSIP checking.

not      Breakpoint only occurs if the CS:EIP is outside the specified range.

start-address    Beginning of memory range.

day-end

Windows-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 causes 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 it 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.

Because 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 do not specify parameters, the current memory range displays.

For Windows 95 and Windows NT

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

Display memory.

Syntax

For Windows 3.1
D[size] [address]

For Windows 95 and Windows NT
D[size] [address [l length]]

size

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
</tr>
<tr>
<td>D</td>
<td>Double Word</td>
</tr>
<tr>
<td>S</td>
<td>Short Real</td>
</tr>
<tr>
<td>L</td>
<td>Long Real</td>
</tr>
<tr>
<td>T</td>
<td>10-Byte Real</td>
</tr>
</tbody>
</table>

Use

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

The contents display in the format of the size you specify. If you do not specify a size, the last size used displays. The ASCII representation displays for the byte, word, and double word hexadecimal formats.

For the dword format, data is displayed in two different ways.

- If the displayed segment is a 32-bit segment, the dwords display as 32-bit hexadecimals (eight hexadecimal digits).
- If the displayed segment is a 16-bit segment (VM segment or LDT selector), the dwords display as 16:16 pointers (four hexadecimal digits ': four more hexadecimal digits).

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.

If the Data window is visible, the data displays there; otherwise, it displays in the Command window. In the Command window, either eight lines display or one less than the length of the window.
For floating point values, numbers can display in the following format:

\[
\text{[leading sign]} \text{ decimal-digits . decimal-digits } E \text{ sign exponent}
\]

The following ASCII strings can also display for real formats:

<table>
<thead>
<tr>
<th>String</th>
<th>Exponent</th>
<th>Mantissa</th>
<th>Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not A Number</td>
<td>all 1’s</td>
<td>NOT 0</td>
<td>+/-</td>
</tr>
<tr>
<td>Denormal</td>
<td>all 0’s</td>
<td>NOT 0</td>
<td>+/-</td>
</tr>
<tr>
<td>Invalid</td>
<td></td>
<td>10 byte only with mantissa=0</td>
<td></td>
</tr>
<tr>
<td>Infinity</td>
<td>all 1’s</td>
<td>0</td>
<td>+/-</td>
</tr>
</tbody>
</table>

**For Windows 95 and Windows NT**

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 is not a multiple of rows, SoftICE will round up. This command is useful when dumping large amounts of data to the Command window for the purpose of logging it to a file.

**Example**

Displays the memory starting at address ES:1000h in word format and in ASCII format.

```
DW es:1000
```

**For Windows 95 and Windows NT**

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 1 1000
```
**DATA**  
*Windows 3.1, Windows 95, Windows 98, Windows NT*  
*Window Control*

**Windows 3.1 - F12**

Change to 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 8, “Customizing SoftICE,” in the *Using SoftICE* manual.

**Example**

Changes the Data window to Data window number 3.

```
DATA 3
```
DEVICE

Display information on Windows NT devices.

Syntax

DEVICE [device-name | pdevice-object]

Use

The DEVICE command displays information on Windows NT 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 \Device object directory. To display information about a device object that is not located in the \Device directory, specify the complete object path name of the device object. 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:

- **RefCount**: 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.
- **CurIrq**: Pointer to the IRP currently being serviced for the device object by the device object's driver.
- **DevExtlen**: 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 FD8CB870 00000000 00000000 00000000 FD8DA0A8  KeyboardClass0
00000001 FD8C9F30 00000000 00000000 00000000 FD8C60F0  Video0
00000001 FD8C9C90 00000000 00000000 00000000 FD8C50F8  Video1
00000001 FD8CC530 00000000 00000000 00000000 FD8DAC08  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
```

This 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**

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.

**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 63.

**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 at by the public variable PointerVariable.

```
DEX 1 @pointervariable
```

**See Also**

DATA
DIAL

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 it uses COM1.

baud-rate Baud-rate to use for modem communications. The default is 38400. The rates are 1200, 2400, 4800, 9600, 19200, 23040, 28800, 38400, 57000, 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 SERIAL.EXE 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.

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 8, “Customizing SoftICE” in the Using SoftICE manual.

On the remote machine, only the com-port, baud-rate, and init parameters should be specified to SERIAL.EXE.

Example

The following is an example of the DIAL command:

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

The command tells SoftICE to first initialize the modem on com-port 2 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 the Dial initialization string in place, SoftICE always initializes the modem specified in DIAL commands with “ATX0”, unless the DIAL command explicitly specifies an initialization string.

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

### See Also

softICE Commands

**DRIVER**

Display information on Windows NT drivers.

**Syntax**

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

**Use**

The DRIVER command displays information on Windows NT 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 \Driver object directory. To display information about a driver that is not located in the \Driver directory, you must specify the complete object path name of the driver.

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 FD8CDAA8 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 FD8CDAA8 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
```
E

Windows 3.1, Windows 95, Windows 98, Windows NT

Display/Change Memory

Edit memory.

Syntax

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

size

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
</tr>
<tr>
<td>D</td>
<td>Double Word</td>
</tr>
<tr>
<td>S</td>
<td>Short Real</td>
</tr>
<tr>
<td>L</td>
<td>Long Real</td>
</tr>
<tr>
<td>T</td>
<td>10-Byte Real</td>
</tr>
</tbody>
</table>

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 its 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.

\texttt{EB\ ds:1000\ 'Test\ String',0}

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

\texttt{ES\ ds:1000\ 3.1415}
EC

Enter or exit the Code window.

Syntax

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

Scroll the Code window from the Command window using the CTRL key with one of the previously mentioned cursor keys. 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.
EXIT

Force an exit of the current DOS or Windows program.

Syntax

EXIT

Use

The EXIT command attempts to abort the current DOS or Windows program by forcing a DOS exit function (INT 21h, function 4Ch). This command only works if 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 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. Because SoftICE can be popped up at any time, a situation can occur where DOS is not in a state to accept an exit function call. Also, the EXIT command does not have any program-specific resetting.

Example: 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 pop up with an unhandled exception occurred dialog box. Press OK to terminate the application.

For Windows 95 and Windows NT

EXIT is no longer supported.

Example

Causes the current DOS or Windows program to exit.

EXIT
EXP

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 name. 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 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 are printed below it, along with their addresses.

**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 95**

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

**For Windows NT**

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 being used to display 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 DELETEATOM 011F:07D4 DELETEFILE
0127:345A DELETEPATHNAME

USER
176F:0C88 DELETEMENU

GDI
0527:0000 DELETEMETAFILE 04B7:211C DELETESPOOLPAGE
047F:55FD DELETEDC 054F:0192 DELETESPQ
047F:564B DELETEOBJECT 04B7:226E DELETEJOB
0587:A22E DELETENHMETAFILE

KERNEL32
0137:BFF97E9B DeleteAtom 0137:BFF8636 DeleteCriticalSection
0137:BFF9DC5A DeleteFileA 0137:BFFA4C49 DeleteFileW

USER32
0137:BFF62228 DeleteMenu

GDI32
0137:BFF3248F DeleteColorSpace 0137:BFF32497 DeleteDC
0137:BFF3248B DeleteEnhMetaFile 0137:BFF31111 DeleteMetaFile
0137:BFF3249F DeleteObject

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

:EXP !

KERNEL
USER
GDI
KERNEL32
USER32
GDI32
The next example is of the EXP command being used to list 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
Fill memory with data.

**Syntax**

\[
F \text{ address } l \text{ length data-list}
\]

- **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 specified length. If the data-list length is less than the specified length, the data-list is repeated as many times as necessary.

**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.

\[
F \text{ ds:8000 } l \text{ 100 'test'}
\]
FAULTS

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

Turns off fault trapping in SoftICE.

FAULTS off

See Also

SET
FIBER

Dump a fiber data structure.

Syntax

FIBER [address]

Use

Use the FIBER command to dump a fiber data structure 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**

Change or display the current source file.

**Syntax**

FILE [[*] file-name]

**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 95 and Windows NT**

Specifying the FILE file-name command switches address contexts within SoftICE, if the current symbol table has an associated address context.

**Example**

If main.c is loaded with the SoftICE Loader, this command displays it in the Code window starting with line 1.

FILE main.c
Show and edit the function key assignments.

FKEY [function-key string]

<table>
<thead>
<tr>
<th>function-key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - F12</td>
<td>Unshifted function key</td>
</tr>
<tr>
<td>SF1 - SF12</td>
<td>Shifted function key</td>
</tr>
<tr>
<td>CF1 - CF12</td>
<td>Control key plus function key</td>
</tr>
<tr>
<td>AF1 - AF12</td>
<td>Alternate key plus function key</td>
</tr>
</tbody>
</table>

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 commands to a function-key. If you do not specify parameters, the current function-key assignments display.

Hint: 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 function-key a series of commands. A carriage return is represented by a semi-colon (;).

If you put a caret “^” or press Shift-6 in front of a command name, the subsequent command becomes invisible. The command functions as normal, 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.
SoftICE implements the function-keys by inserting the entire string into its keyboard buffer. The function-keys can therefore be used anywhere where a valid command can be typed. If you want a function-key assignment to be in effect every time you use SoftICE, pre-initialize the keyboard mappings within your SOFTICE configuration settings. Refer to Chapter 8, “Customizing SoftICE” in the Using SoftICE guide.

Example

This example assigns the toggle Register window command 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, press the F2 key to toggle the Register window on or off.

FKEY f2 ^wr;

The next 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:8028f000h d ss:esp u cs:eip+

After you enter this 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 toggles the Register window, and creates a Locals window of length 8 and a Code window of length 10.

FKEY f1 wr;wl 8 wc 10;
FOBJ

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 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 the FOBJ command’s output:

```
: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
FLASH

Windows 3.1, Windows 95, Windows 98, Windows NT  
Window Control

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.

If the routine being called writes to the Windows screen and if the P command executes across a call, the screen restores. When debugging protected mode applications such as VxDs or Windows applications with FLASH off, this is generally not the case. 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

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

FLASH on

See Also

SET
FORMAT

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. Change the formats in the order byte, word, dword, short real, long real, 10-byte real, and then starting back at byte. This command is most useful when assigned to a function key. The default function key assignment is Shift-F3. The Shift-F3 is also supported when editing in the Data window.

Example

Changes the Data window to the next data format.

FORMAT
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 style breakpoint.

**For Windows 95 and Windows NT**

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

**Example**

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

```
G 80123456
```
**GDT**

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 an LDT selector (bit 2 is a 1), SoftICE automatically displays information from the LDT, rather than the GDT.

**Output**

The base linear address and 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:

<table>
<thead>
<tr>
<th>selector value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>selector type</td>
<td>Lower two bits of this value reflects the descriptor privilege level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code16</td>
<td>16-bit code selector</td>
</tr>
<tr>
<td>Data16</td>
<td>16-bit data selector</td>
</tr>
<tr>
<td>Code32</td>
<td>32-bit code selector</td>
</tr>
<tr>
<td>Data32</td>
<td>32-bit data selector</td>
</tr>
<tr>
<td>LDT</td>
<td>Local Descriptor Table selector</td>
</tr>
<tr>
<td>TSS32</td>
<td>32-bit Task State Segment selector</td>
</tr>
<tr>
<td>TSS16</td>
<td>16-bit Task State Segment selector</td>
</tr>
<tr>
<td>CallG32</td>
<td>32-bit Call Gate selector</td>
</tr>
<tr>
<td>CallG16</td>
<td>16-bit Call Gate selector</td>
</tr>
<tr>
<td>TaskG32</td>
<td>32-bit Task Gate selector</td>
</tr>
<tr>
<td>TaskG16</td>
<td>16-bit Task Gate selector</td>
</tr>
<tr>
<td>TrapG32</td>
<td>32-bit Trap Gate selector</td>
</tr>
</tbody>
</table>

*System Information*
### SoftICE Commands

**selector base**
Linear base address of the selector.

**selector limit**
Size of selector's segment.

**selector DPL**
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:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW</td>
<td>Data selector is readable and writable.</td>
</tr>
<tr>
<td>RO</td>
<td>Data selector is read only.</td>
</tr>
<tr>
<td>RE</td>
<td>Code selector is readable and executable.</td>
</tr>
<tr>
<td>EO</td>
<td>Code selector is execute only.</td>
</tr>
<tr>
<td>B</td>
<td>TSS's busy bit is set.</td>
</tr>
<tr>
<td>ED</td>
<td>Expand down data selector.</td>
</tr>
</tbody>
</table>

### Example
The following command shows abbreviated output from the GDT command.

```
:GDT
```

<table>
<thead>
<tr>
<th>Sel.</th>
<th>Type</th>
<th>Base</th>
<th>Limit</th>
<th>DPL</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDTbase=C1398000 Limit=OFFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0008</td>
<td>Code16 00017370</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td>RE</td>
</tr>
<tr>
<td>0010</td>
<td>Data16 00017370</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td>RW</td>
</tr>
<tr>
<td>0018</td>
<td>TSS32 C000AEBC</td>
<td>00000269</td>
<td>0</td>
<td>P</td>
<td>B</td>
</tr>
<tr>
<td>0020</td>
<td>Data16 C1398000</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td>RW</td>
</tr>
<tr>
<td>0028</td>
<td>Code32 00000000</td>
<td>FFFFFFFF</td>
<td>0</td>
<td>P</td>
<td>RE</td>
</tr>
<tr>
<td>0030</td>
<td>Data32 00000000</td>
<td>FFFFFFFF</td>
<td>0</td>
<td>P</td>
<td>RW</td>
</tr>
<tr>
<td>003B</td>
<td>Code16 C33E9800</td>
<td>0000007F</td>
<td>3</td>
<td>P</td>
<td>RE</td>
</tr>
<tr>
<td>0043</td>
<td>Data16 00000400</td>
<td>000002FF</td>
<td>3</td>
<td>P</td>
<td>RW</td>
</tr>
<tr>
<td>0048</td>
<td>Code16 00013B10</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td>RE</td>
</tr>
<tr>
<td>0050</td>
<td>Data16 00013B10</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td>RW</td>
</tr>
<tr>
<td>0058</td>
<td>Reserved 00000000</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>0060</td>
<td>Reserved 00000000</td>
<td>000000FF</td>
<td>0</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>0068</td>
<td>TSS32 C0015DE8</td>
<td>00000068</td>
<td>0</td>
<td>P</td>
<td></td>
</tr>
</tbody>
</table>
GENINT

Windows 3.1, Windows 95, Windows 98, Windows NT

Force an interrupt to occur.

Syntax

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

`interrupt-number`

- For Windows 3.1 and Windows 95: Valid interrupt number between 0 and 5Fh.
- For Windows NT: 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. Also use it 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.

**Warning:** Ensure that there is a valid interrupt handler before using this command. SoftICE does not know if there is a handler installed. Your machine will most likely crash if there is not one.

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
```

For 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. When this happens, 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
```
Display help information.

**Syntax**

For Windows 3.1

\[H \ [\text{command} \ | \ \text{expression}]\]

For Windows 95 and Windows NT

\[H \ [\text{command}]\]

**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 95 and Windows NT

Under Windows 95 and Windows NT, the H command displays help on SoftICE commands. (Refer to ? on page 3 for information about evaluating expressions under Windows 95 and Windows NT.) 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**

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**

To make the system reboot, use this command:

HBOOT
HEAP

Display the Windows global heap.

Syntax

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

- `-L` Display only global heap entries that contain a local heap.
- `module-name` Name of the module.
- `selector` LDT selector.

Use

**For Windows 95**

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

**For Windows NT**

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.

**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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Non-discardable code segment</td>
</tr>
<tr>
<td>Code D</td>
<td>Discardable code segment</td>
</tr>
<tr>
<td>Data</td>
<td>Data segment</td>
</tr>
<tr>
<td>ModuleDB</td>
<td>Module data base segment</td>
</tr>
<tr>
<td>TaskDB</td>
<td>Task data base segment</td>
</tr>
<tr>
<td>BurgerM</td>
<td>Burger Master (The heap itself)</td>
</tr>
<tr>
<td>Alloc</td>
<td>Allocated memory</td>
</tr>
<tr>
<td>Resource</td>
<td>Windows Resource</td>
</tr>
</tbody>
</table>

*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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Icon</th>
<th>String</th>
<th>Accel</th>
<th>IconGrp</th>
<th>Cursor</th>
<th>Menu</th>
<th>FontGrp</th>
<th>ErrTable</th>
<th>NameTabl</th>
<th>Bitmap</th>
<th>Dialog</th>
<th>Font</th>
<th>CursGrp</th>
</tr>
</thead>
</table>
Example

To display all heap entries belonging to the KERNEL module, use the following command:

```
HEAP kernel
```

<table>
<thead>
<tr>
<th>Han/Sel</th>
<th>Address</th>
<th>Length</th>
<th>Owner</th>
<th>Type</th>
<th>Seg/Rsr</th>
</tr>
</thead>
<tbody>
<tr>
<td>00F5</td>
<td>000311C0</td>
<td>000004C0</td>
<td>KERNEL</td>
<td>ModuleDB</td>
<td></td>
</tr>
<tr>
<td>00FD</td>
<td>00031680</td>
<td>00007600</td>
<td>KERNEL</td>
<td>Code</td>
<td>01</td>
</tr>
<tr>
<td>0575</td>
<td>00054220</td>
<td>00003640</td>
<td>KERNEL</td>
<td>Alloc</td>
<td></td>
</tr>
<tr>
<td>0106</td>
<td>00083E40</td>
<td>00002660</td>
<td>KERNEL</td>
<td>Code D</td>
<td>02</td>
</tr>
<tr>
<td>010E</td>
<td>805089A0</td>
<td>00001300</td>
<td>KERNEL</td>
<td>Code D</td>
<td>03</td>
</tr>
<tr>
<td>0096</td>
<td>80520440</td>
<td>00000C20</td>
<td>KERNEL</td>
<td>Alloc</td>
<td></td>
</tr>
</tbody>
</table>

Total Memory: 62K

See Also

For Windows 95, refer to `HEAP32` on page 97.
For Windows NT, refer to `HEAP32` on page 100.
HEAP32

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 95

The HEAP32 command displays heaps for a process.

Note: For 16-bit modules, use the HEAP32 on page 100.

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.

For Windows 3.1, Windows 95, and Windows NT, refer to HEAP on page 94.

For Windows NT, refer to HEAP32 on page 100.

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 95 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 where the heap begins.

MaxSize Current maximum size 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

<table>
<thead>
<tr>
<th>Heap Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>Ring 3 heap created by an application process.</td>
</tr>
<tr>
<td>System</td>
<td>Ring 3 default heap for KERNEL32.</td>
</tr>
<tr>
<td>Ring0</td>
<td>Ring 0 heap created by VMM.</td>
</tr>
<tr>
<td>VM##</td>
<td>Heap created by VMM for a specific Virtual Machine to hold data structures specific to that VM.</td>
</tr>
</tbody>
</table>

Owner

Name of the process that owns the heap.

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

<table>
<thead>
<tr>
<th>Heap Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address of the heap element</td>
</tr>
<tr>
<td>Size</td>
<td>Size in bytes of the heap element</td>
</tr>
<tr>
<td>Free</td>
<td>If the heap element is a free block, the word FREE appears; otherwise, the field is blank.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Heap Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP</td>
<td>EIP address of the code that allocated the heap element.</td>
</tr>
<tr>
<td>TID</td>
<td>VMM thread-id of the allocating thread</td>
</tr>
<tr>
<td>Owner</td>
<td>Nearest symbol to the EIP address</td>
</tr>
</tbody>
</table>
Example

To display all 32-bit heaps, use the command:

**HEAP32**

<table>
<thead>
<tr>
<th>HeapBase</th>
<th>Max Size</th>
<th>Committed</th>
<th>Segments</th>
<th>Type</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>00EA0000</td>
<td>1024K</td>
<td>8K</td>
<td>1</td>
<td>Private</td>
<td>Mapisp32</td>
</tr>
<tr>
<td>00DA0000</td>
<td>1024K</td>
<td>8K</td>
<td>1</td>
<td>Private</td>
<td>Mapisp32</td>
</tr>
<tr>
<td>00CA0000</td>
<td>1024K</td>
<td>8K</td>
<td>1</td>
<td>Private</td>
<td>Mapisp32</td>
</tr>
<tr>
<td>00960000</td>
<td>1024K</td>
<td>8K</td>
<td>1</td>
<td>Private</td>
<td>Mapisp32</td>
</tr>
<tr>
<td>00860000</td>
<td>1024K</td>
<td>8K</td>
<td>1</td>
<td>Private</td>
<td>Mapisp32</td>
</tr>
</tbody>
</table>

To display all heap entries for Exchng32, use the command:

**HEAP32** `exchng32`

Heap: 00400000  Max Size: 1028K  Committed: 12K  Segments: 1

<table>
<thead>
<tr>
<th>Address</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>00400078</td>
<td>000004E4</td>
</tr>
<tr>
<td>00400560</td>
<td>00000098</td>
</tr>
<tr>
<td>004005FC</td>
<td>00000054</td>
</tr>
<tr>
<td>00400654</td>
<td>000000A4</td>
</tr>
<tr>
<td>004006FC</td>
<td>00000010</td>
</tr>
<tr>
<td>00400710</td>
<td>00000014</td>
</tr>
</tbody>
</table>

For Windows 3.1, Windows 95, and Windows NT, refer to *HEAP* on page 94.
For Windows NT, refer to *HEAP32* on page 100.
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 94 for Windows 3.1. This information only applies to HEAP32.

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

The -Xtended option 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 displays a simple summary for the heap, and 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 is an extremely powerful option, as it 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:
  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:
  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:
  Free block: 00140E50: Free block failed FREE CHECK at 141E70

Use the -Base option 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, including the heap-entry header and any extra data allocated for guard-bytes, or to satisfy alignment requirements. Under most circumstances you will not want to specify base addressing unless you are trying 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. This happens because the heap-entry header precedes the actual heap-entry by 8 bytes. Secondly, the size for the allocated blocks is larger because of the additional 8 bytes for the heap-entry header, guard-bytes, and, if necessary, any extra bytes needed for proper alignment. The output from the -Base option is useful for manually navigating between adjacent heap entries, or checking for memory overruns between the end of the heap-entry data and any unused space prior to the guard-bytes, which 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.

Use the -TRACE option 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 be running 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 a process-type is passed 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.

*Example:* This command performs a heap validation for all the heaps in the Test32 process:

```
HEAP 32 -v test32
```

When using bare addresses, for example, 0x140000, the current context is assumed. Use the ADDR command to change to the appropriate context.

For Not Present Memory, due to the nature of operating systems that use paging to implement virtual memory, in some cases, the actual physical memory that backs a particular linear address will not be present in memory. To be useful within this restriction, the HEAP32 command detects, avoids, and, where possible, continues to operate without the need for not present pages. In all cases where 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. Because 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/Pnt/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.
### SoftICE Commands

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEAP</strong></td>
<td>Represents the heap header.</td>
</tr>
<tr>
<td><strong>SEGMENT</strong></td>
<td>Represents a heap segment.</td>
</tr>
<tr>
<td><strong>ALLOC</strong></td>
<td>Active heap entry</td>
</tr>
<tr>
<td><strong>FREE</strong></td>
<td>Inactive heap entry</td>
</tr>
<tr>
<td><strong>VABLOCK</strong></td>
<td>Virtually allocated block (VAB)</td>
</tr>
</tbody>
</table>

#### 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:

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

**HEAP32**

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

### See Also

For Windows 3.1, Windows 95, and Windows NT, refer to *HEAP* on page 94. For Windows 95, refer to *HEAP32* on page 97.
HERE

Go to the current cursor line.

Syntax

HERE

Use

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 that you want to execute to. Enter HERE or press the function key that HERE is programmed to (default key F7).

The HERE command exits from SoftICE with a single, one-time execution breakpoint set. In addition, all sticky breakpoints are armed.

Execution begins at the current CS:EIP and continues until the address of the current cursor position in the Code window is encountered, the window pop-up key sequence is used, or a sticky breakpoint occurs. When SoftICE pops up, for any reason, 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 style breakpoint.

For Windows 95 and Windows NT

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

Example

Sets an execution breakpoint at the current cursor position, then exits from SoftICE and begins execution at the current CS:EIP.

HERE
HWND

Display information on Window handles.

Syntax

For Windows 3.1

\texttt{HWND \([level]\ [task-name]\)}

For Windows 95

\texttt{HWND \([-x]\ hwnd \ [level]\ [process-name]\)}

\texttt{level} \quad \text{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.}

\texttt{task-name} \quad \text{Any currently loaded Windows task. These names are available with the TASK command.}

\texttt{-x} \quad \text{Display extended information about a window.}

\texttt{hwnd} \quad \text{Windows handle.}

\texttt{process-name} \quad \text{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:

\texttt{Class Name} \quad \text{Class name or atom of class that this window belongs to.}

\texttt{Window Procedure} \quad \text{Address of the window procedure for this window.}
Example

Sample output follows for the HWND command:

```plaintext
HWND msword
```

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

Abbreviated output follows for the HWND command:

```plaintext
HWND -x winword
```

```plaintext
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
hInstance       : (349E) (16 bit hInstance)
lpfnWndProc     : 2417:000057F8
## SoftICE Commands

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Handle</td>
<td>(0288) Level (1)</td>
</tr>
<tr>
<td>dwFlags1</td>
<td>40002</td>
</tr>
<tr>
<td>dwStyle</td>
<td>44A08053</td>
</tr>
<tr>
<td>dwExStyle</td>
<td>88</td>
</tr>
<tr>
<td>dwFlags2</td>
<td>0</td>
</tr>
<tr>
<td>ctrlID/hMenu</td>
<td>03E8</td>
</tr>
<tr>
<td>WndText</td>
<td>NULL</td>
</tr>
<tr>
<td>unknown1</td>
<td>4734</td>
</tr>
<tr>
<td>propertyList</td>
<td>NULL</td>
</tr>
<tr>
<td>lastActive</td>
<td>NULL</td>
</tr>
<tr>
<td>hSystemMenu</td>
<td>NULL</td>
</tr>
<tr>
<td>unknown2</td>
<td>0</td>
</tr>
<tr>
<td>unknown3</td>
<td>0000</td>
</tr>
<tr>
<td>classAtom</td>
<td>C036</td>
</tr>
<tr>
<td>unknown4</td>
<td>4CAC</td>
</tr>
<tr>
<td>unknown5</td>
<td>A0000064</td>
</tr>
</tbody>
</table>

**See Also**

For Windows NT, refer to *HWND* on page 109.
HWND

Display information on Window handles.

Syntax

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

-Extended  Display extended information about each window handle.
-Children  Force the display of 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.

For Windows 3.1 and Windows 95, refer to HWND on page 106.

The -Extended option shows extended information about each window.
When you specify the -Extended option, or an owner-type as a parameter, the HWND command will not automatically enumerate child windows. Specifying the -Children option 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 147 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 48 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:

<table>
<thead>
<tr>
<th>Handle</th>
<th>Class</th>
<th>WinProc</th>
<th>TID</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>01001E</td>
<td>#32769 (Desktop)</td>
<td>5FBFE425</td>
<td>24</td>
<td>winsrv</td>
</tr>
<tr>
<td>050060</td>
<td>#32770 (Dialog)</td>
<td>60A29304</td>
<td>18</td>
<td>winlogon</td>
</tr>
<tr>
<td>010044</td>
<td>SAS window class</td>
<td>022A49C4</td>
<td>18</td>
<td>winlogon</td>
</tr>
<tr>
<td>010020</td>
<td>#32768 (PopupMenu)</td>
<td>5FBEDBD5</td>
<td>24</td>
<td>winsrv</td>
</tr>
<tr>
<td>010022</td>
<td>#32769 (Desktop)</td>
<td>5FBFE425</td>
<td>24</td>
<td>winsrv</td>
</tr>
<tr>
<td>010024</td>
<td>#32768 (PopupMenu)</td>
<td>5FBEDBD5</td>
<td>24</td>
<td>winsrv</td>
</tr>
<tr>
<td>030074</td>
<td>Shell_TrayWnd</td>
<td>0101775E</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>030072</td>
<td>Button</td>
<td>01012A4E</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>0800AA</td>
<td>TrayNotifyWnd</td>
<td>010216C4</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>03003E</td>
<td>TrayClockWClass</td>
<td>01028C85</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>030078</td>
<td>MTaskSwWClass</td>
<td>01022F69</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>030076</td>
<td>SysTabControl32</td>
<td>712188A8</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>05007A</td>
<td>tooltips_class32</td>
<td>7120B43A</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>03003C</td>
<td>tooltips_class32</td>
<td>7120B43A</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>2E00F0</td>
<td>NDDEAgnt</td>
<td>016E18F1</td>
<td>4B</td>
<td>nddeagnt</td>
</tr>
<tr>
<td>1C0148</td>
<td>CLIPBOARDWNDCLASS</td>
<td>034F:2918</td>
<td>2C</td>
<td>OLE2</td>
</tr>
<tr>
<td>9B0152</td>
<td>DdeCommonWindowClass</td>
<td>77C2D88B</td>
<td>2C</td>
<td>ole32</td>
</tr>
<tr>
<td>3200F2</td>
<td>OleObjectRcpWindow</td>
<td>77C2D73B</td>
<td>2C</td>
<td>ole32</td>
</tr>
<tr>
<td>0800A2</td>
<td>DdeCommonWindowClass</td>
<td>77C2D88B</td>
<td>67</td>
<td>ole32</td>
</tr>
<tr>
<td>030086</td>
<td>OleMainThreadWndClass</td>
<td>77C2DCF2</td>
<td>67</td>
<td>ole32</td>
</tr>
<tr>
<td>030088</td>
<td>OleObjectRcpWindow</td>
<td>77C2D73B</td>
<td>67</td>
<td>ole32</td>
</tr>
<tr>
<td>03008A</td>
<td>ProxyTarget</td>
<td>71E6869A</td>
<td>67</td>
<td>shell32</td>
</tr>
<tr>
<td>03008C</td>
<td>ProxyTarget</td>
<td>71E6869A</td>
<td>67</td>
<td>shell32</td>
</tr>
<tr>
<td>030070</td>
<td>ProxyTarget</td>
<td>71E6869A</td>
<td>67</td>
<td>shell32</td>
</tr>
<tr>
<td>04007C</td>
<td>ProxyTarget</td>
<td>71E6869A</td>
<td>67</td>
<td>shell32</td>
</tr>
<tr>
<td>0400CC</td>
<td>OTClass</td>
<td>0100D7F3</td>
<td>67</td>
<td>Explorer</td>
</tr>
<tr>
<td>0300CA</td>
<td>DDEMLEvent</td>
<td>5FC216AB</td>
<td>67</td>
<td>winsrv</td>
</tr>
<tr>
<td>0300C6</td>
<td>DDEMLMom</td>
<td>60A2779D</td>
<td>67</td>
<td>00000000</td>
</tr>
<tr>
<td>0300C0</td>
<td>#42</td>
<td>0BB7:0776</td>
<td>78</td>
<td>MMSYSTEM</td>
</tr>
<tr>
<td>0300D2</td>
<td>WOWFaxClass</td>
<td>01F97A8</td>
<td>78</td>
<td>WOWEXEC</td>
</tr>
<tr>
<td>060062</td>
<td>ConsoleWindowClass</td>
<td>5FC23C7</td>
<td>2B</td>
<td>winsrv</td>
</tr>
<tr>
<td>0300B4</td>
<td>WOWExecClass</td>
<td>03CF:0B3E</td>
<td>78</td>
<td>WOWEXEC</td>
</tr>
</tbody>
</table>
Notes: You may have noticed that the output from the previous example enumerated 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.

Because the system may have 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 for a specific window handle:

```
HWND 400a0
Handle  Class       WinProc  TID  Module
0400A0  Progman     0101B1D3 74  Explorer
```

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

```
HWND 74
Handle  Class                   WinProc  TID  Module
2F00F0  Shell_TrayWnd           0101775E 74  Explorer
0500CE  Button                 01012A4E 74  Explorer
0500C4  TrayNotifyWnd           010216C4 74  Explorer
040074  TrayClockWClass         01028C85 74  Explorer
0500C6  MSTaskSwWClass          01022F69 74  Explorer
0400C8  SysTabControl32         712188A8 74  Explorer
3700F2  tooltips_class32        7120B43A 74  Explorer
040066  tooltips_class32        7120B43A 74  Explorer
0F00BC  DdeCommonWindowClass    77C2D88B 74  ole32
040068  OleMainThreadWndClass   77C2DCF2 74  ole32
0500CC  OleObjectRpcWindow      77C2D73B 74  ole32
2600BA  ProxyTarget            71E6869A 74  shell32
0400D0  ProxyTarget            71E6869A 74  shell32
0400CA  ProxyTarget            71E6869A 74  shell32
070094  ProxyTarget            71E6869A 74  shell32
04009E  OTClass                 0100D7F3 74  Explorer
480092  DDEMLEvent             5FCC216AB 74  winsrv
09004A  DDEMLMom                60A2779D 74  00000000
SoftICE Commands

<table>
<thead>
<tr>
<th>Address</th>
<th>Module</th>
<th>Proc</th>
<th>Base Address</th>
<th>Win Version</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>0400A0</td>
<td>Progman</td>
<td>0101B1D3</td>
<td>74 Explorer</td>
<td>4.00</td>
<td>Program Manager</td>
</tr>
<tr>
<td>0500C0</td>
<td>SHELLDLL_DefView</td>
<td>71E300E8</td>
<td>74 shell32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>070090</td>
<td>SysListView32</td>
<td>7121A0EC</td>
<td>74 shell32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>050096</td>
<td>SysHeader32</td>
<td>7120B06F</td>
<td>74 shell32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 is used:

```
HWND -x 400a0
```

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hwnd</td>
<td>0400A0 (7F2D7148)</td>
</tr>
<tr>
<td>Class Name</td>
<td>Progman</td>
</tr>
<tr>
<td>Module</td>
<td>Explorer</td>
</tr>
<tr>
<td>Window Proc</td>
<td>0101B1D3</td>
</tr>
<tr>
<td>Win Version</td>
<td>4.00</td>
</tr>
<tr>
<td>Title</td>
<td>Program Manager</td>
</tr>
<tr>
<td>Desktop</td>
<td>02001F (00402D58)</td>
</tr>
<tr>
<td>Parent</td>
<td>010022 (7F2D0C28)</td>
</tr>
<tr>
<td>1st Child</td>
<td>0500C0 (7F2D7600)</td>
</tr>
<tr>
<td>Style</td>
<td>CLIPCHILDREN</td>
</tr>
<tr>
<td>Ex. Style</td>
<td>TOOLWINDOW</td>
</tr>
<tr>
<td>Window Rect</td>
<td>0, 0, 1024, 768 (1024 x 768)</td>
</tr>
<tr>
<td>Client Rect</td>
<td>0, 0, 1024, 768 (1024 x 768)</td>
</tr>
</tbody>
</table>

**See Also**

For Windows 3.1 and Windows 95, refer to HWND on page 106.
**I**

Windows 3.1, Windows 95, Windows 98, Windows NT

**I/O Port**

Input a value from an I/O port.

**Syntax**

```
I[size] port
```

<table>
<thead>
<tr>
<th>size</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>DWORD</td>
<td></td>
</tr>
</tbody>
</table>

**port**

Port address.

**Use**

The `I` command in most cases does an actual I/O instruction so it is showing the actual state of the hardware port. In the case of virtualized ports, the actual data 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.

Use the input from port commands to read and display a value from a hardware port. Input can be done from byte, word, or dword ports. If you do not specify size, the default is B.

**Example**

Performs an input from port 21, which is the mask register for interrupt controller one.

```
I 21
```
**I1HERE**

**Pop up on embedded INT 1 instructions.**

**Syntax**

```
I1HERE [on | off]
```

**Use**

Use the I1HERE command to specify that any embedded interrupt 1 bring up the SoftICE screen. This feature is useful for stopping your program in a specific location. Before popping up, SoftICE checks to see that there is really an INT 1 in the code. If there is not, 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, you should use INT 1s in your code so that the tools do not become confused when your hardwired interrupts occur.

**For Windows 3.1 and Windows 95**

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**

Turns on I1HERE mode. Any INT 1s generated after this point bring up the SoftICE screen.

```
I1HERE on
```
I3HERE

Pop up on INT 3 instructions.

Syntax

I3HERE [on | off]

Use

Use the I3HERE command to specify that any interrupt 3 pop up SoftICE. This feature is useful for stopping your program in a specific location.

To use this feature, place an INT 3 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 NuMega’s BoundsChecker, you should place INT 1s in your code instead of INT 3s. Refer to I1HERE on page 114.

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. When this happens, 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, I3HERE, SET
IDT

Display the Interrupt Descriptor Table.

Syntax

IDT [interrupt-number]

interrupt-number Interrupt-number to display information

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, only information about that entry is displayed.

For Windows NT

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 (refer to TABLE on page 194) to view symbol names.

Output

Each line of the display contains the following information:

<table>
<thead>
<tr>
<th>interrupt number</th>
<th>0 - 0FFh (5Fh for Windows 3.1, Windows 95).</th>
</tr>
</thead>
<tbody>
<tr>
<td>interrupt type</td>
<td>One of the following:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CallG32</td>
<td>32-bit Call Gate</td>
</tr>
<tr>
<td>CallG16</td>
<td>16-bit Call Gate</td>
</tr>
<tr>
<td>TaskG</td>
<td>Task Gate</td>
</tr>
<tr>
<td>TrapG16</td>
<td>16-bit Trap Gate</td>
</tr>
<tr>
<td>TrapG32</td>
<td>32-bit Trap Gate</td>
</tr>
<tr>
<td>IntG32</td>
<td>32-bit Interrupt Gate</td>
</tr>
<tr>
<td>IntG16</td>
<td>16-bit Interrupt Gate</td>
</tr>
</tbody>
</table>

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 95 and Windows NT 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:

```plaintext
:IDT
IDTbase=C000ABBC  Limit=02FF
```

<table>
<thead>
<tr>
<th>Int</th>
<th>Type</th>
<th>Sel:Offset</th>
<th>Attributes</th>
<th>Symbol/Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>IntG32</td>
<td>0028:C0001200</td>
<td>DPL=0</td>
<td>VMM(01)+0200</td>
</tr>
<tr>
<td>001</td>
<td>IntG32</td>
<td>0028:C0001210</td>
<td>DPL=3</td>
<td>VMM(01)+0210</td>
</tr>
<tr>
<td>002</td>
<td>IntG32</td>
<td>0028:C00EEDFC</td>
<td>DPL=0</td>
<td>VTBS(01)+1D04</td>
</tr>
<tr>
<td>003</td>
<td>IntG32</td>
<td>0028:C0001220</td>
<td>DPL=3</td>
<td>VMM(01)+0220</td>
</tr>
<tr>
<td>004</td>
<td>IntG32</td>
<td>0028:C0001230</td>
<td>DPL=3</td>
<td>VMM(01)+0230</td>
</tr>
<tr>
<td>005</td>
<td>IntG32</td>
<td>0028:C0001240</td>
<td>DPL=3</td>
<td>VMM(01)+0240</td>
</tr>
<tr>
<td>006</td>
<td>IntG32</td>
<td>0028:C0001250</td>
<td>DPL=0</td>
<td>VMM(01)+0250</td>
</tr>
<tr>
<td>007</td>
<td>IntG32</td>
<td>0028:C0001260</td>
<td>DPL=0</td>
<td>VMM(01)+0260</td>
</tr>
<tr>
<td>008</td>
<td>TaskG</td>
<td>0068:00000000</td>
<td>DPL=0</td>
<td></td>
</tr>
<tr>
<td>009</td>
<td>IntG32</td>
<td>0028:C000126C</td>
<td>DPL=0</td>
<td>VMM(01)+026C</td>
</tr>
<tr>
<td>00A</td>
<td>IntG32</td>
<td>0028:C000128C</td>
<td>DPL=0</td>
<td>VMM(01)+028C</td>
</tr>
</tbody>
</table>

The next command shows the contents of one entry in the IDT:

```plaintext
:IDT d
```

<table>
<thead>
<tr>
<th>Int</th>
<th>Type</th>
<th>Sel:Offset</th>
<th>Attributes</th>
<th>Symbol/Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>00D</td>
<td>IntG32</td>
<td>0028:C00012B0</td>
<td>DPL=0</td>
<td>VMM(01)+02B0</td>
</tr>
</tbody>
</table>

---

**SoftICE Command Reference**  
117
IRP

Display information about an I/O Request Packet (IRP).

Syntax

IRP [irp-address]

irp-address Address of 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. The command does not check for the validity of the IRP structure being shown, so any address will be accepted by SoftICE as an irp-address.

The IRP 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 DDK. A few fields deserve special mention, however, since 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 for this command.

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.
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 that the IRP is currently stationed at. 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 Rout**
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
CancelIrlq : 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
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 GDT selector (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 95 and Windows NT**

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 Windows NT**

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
```

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code16</td>
<td>16-bit code selector</td>
</tr>
<tr>
<td>Data16</td>
<td>16-bit data selector</td>
</tr>
<tr>
<td>Code32</td>
<td>32-bit code selector</td>
</tr>
<tr>
<td>Data32</td>
<td>32-bit data selector</td>
</tr>
<tr>
<td>CallG32</td>
<td>32-bit Call Gate selector</td>
</tr>
<tr>
<td>CallG16</td>
<td>16-bit Call Gate selector</td>
</tr>
</tbody>
</table>
SoftICE Commands

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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW</td>
<td>Data selector is readable and writable.</td>
</tr>
<tr>
<td>RO</td>
<td>Data selector is read only.</td>
</tr>
<tr>
<td>RE</td>
<td>Code selector is readable and executable.</td>
</tr>
<tr>
<td>EO</td>
<td>Code selector is execute only.</td>
</tr>
<tr>
<td>B</td>
<td>TSS’s busy bit is set.</td>
</tr>
</tbody>
</table>

Example

The following example shows sample output for the LDT command.

:LDT

<table>
<thead>
<tr>
<th>Sel.</th>
<th>Type</th>
<th>Base</th>
<th>Limit</th>
<th>DPL</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LDTbase=8008B000</td>
<td>Limit=4FFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0004</td>
<td>Reserved</td>
<td>00000000</td>
<td>00000000</td>
<td>0</td>
<td>NP</td>
</tr>
<tr>
<td>000C</td>
<td>Reserved</td>
<td>00000000</td>
<td>00000000</td>
<td>0</td>
<td>NP</td>
</tr>
<tr>
<td>0087</td>
<td>Data16</td>
<td>80001000</td>
<td>00000FFF</td>
<td>3</td>
<td>P</td>
</tr>
<tr>
<td>008F</td>
<td>Data16</td>
<td>00847000</td>
<td>0000FFFF</td>
<td>3</td>
<td>P RW</td>
</tr>
<tr>
<td>0097</td>
<td>Data16</td>
<td>0002DA80</td>
<td>0000021F</td>
<td>3</td>
<td>P RW</td>
</tr>
<tr>
<td>009F</td>
<td>Data16</td>
<td>00099940</td>
<td>000029FF</td>
<td>3</td>
<td>P RW</td>
</tr>
<tr>
<td>00A7</td>
<td>Data16</td>
<td>0001BAC0</td>
<td>000000FF</td>
<td>3</td>
<td>P RW</td>
</tr>
<tr>
<td>00AF</td>
<td>Data16</td>
<td>C11D9040</td>
<td>0000057F</td>
<td>3</td>
<td>P RW</td>
</tr>
</tbody>
</table>
LHEAP

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 95 and Windows NT

To find all segments that contain a local heap, use the HEAP command with the -L option.

For Windows NT

The LHEAP command only works if the current process contains a WOW box.

Output

For each local heap entry the following information displays:

<table>
<thead>
<tr>
<th>offset</th>
<th>16-bit offset relative to the specified selector base address.</th>
</tr>
</thead>
<tbody>
<tr>
<td>size</td>
<td>Size of the heap entry in bytes.</td>
</tr>
<tr>
<td>type</td>
<td>Type of entry. One of the following:</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>FIX</td>
<td>Fixed (not moveable)</td>
</tr>
<tr>
<td>MOV</td>
<td>Moveable</td>
</tr>
<tr>
<td>FREE</td>
<td>Available memory</td>
</tr>
</tbody>
</table>
**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**

To display all local heap entries belonging to the GDI default local heap, use the following command:

```
LHEAP gdi
```

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Type</th>
<th>Handle</th>
</tr>
</thead>
<tbody>
<tr>
<td>93D2</td>
<td>0046</td>
<td>Mov</td>
<td>0DFA</td>
</tr>
<tr>
<td>941E</td>
<td>0046</td>
<td>Mov</td>
<td>0C52</td>
</tr>
<tr>
<td>946A</td>
<td>0046</td>
<td>Mov</td>
<td>40DA</td>
</tr>
<tr>
<td>94B6</td>
<td>004E</td>
<td>Mov</td>
<td>0C66</td>
</tr>
<tr>
<td>950A</td>
<td>4A52</td>
<td>Mov</td>
<td>0E52</td>
</tr>
</tbody>
</table>

Used: 19.3K
LINES

Change the number of lines for the SoftICE display.

Syntax

For Windows 3.1
LINES [25 | 43 | 50]

For Windows 95 and Windows NT
With Universal Video Driver:
LINES numlines
numlines Number of screen lines. Set this to any value greater than 25.

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 43-, 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 95 and Windows NT
You can display 60 lines for single monitor debugging.

When debugging in serial mode, all line counts are supported for VGA displays.

Example

To change the SoftICE display to 53 lines using the Universal Video Driver, use the following command. The current font affects the number of lines SoftICE can display.

LINES 53

See Also

SET, WIDTH
LOCALS

Lists 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 local 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.

Hint: 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. Note that 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
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**

Moves 2000h bytes (8KB) from memory location DS:1000h to ES:5000h.

```
M ds:1000 l 2000 es:5000
```
Define a new command that is a superset of SoftICE commands.

**Syntax**

```markdown
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:

```markdown
MACRO macro-name = "macro body"
```

The macro-name parameter can be between 3 and 8 characters long, and may contain any alphanumeric character or underscore (_). If the macro-name parameter specifies an existing macro, the existing macro will be redefined. 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 (\). Because 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, although crude, 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 is an example of using the MACRO command without parameters or options:

```plaintext
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 are more examples of basic usage of the MACRO command:

```plaintext
MACRO * Delete all named macros.
MACRO oops * Delete the macro named oops.
MACRO xwhat Edit the macro named xwhat.
```

**Note:** Because 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 is a simple example of a macro definition:

```plaintext
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 this 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 this 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"
Explanation: This is a duplication of a SoftICE command. SoftICE commands cannot be redefined.
Corrected Example: MACRO dda = "dd dataaddr"
Illegal Definition: MACRO aa = "addr %1"
Explanation: The macro command name is too short. A macro name must be between 3 and 8 characters long.
Corrected Example: MACRO aaa = "addr %1"

Illegal Definition: MACRO pbsz = ? hbyte(hiword(*(%1-8))) << 5
Explanation: The macro body must be surrounded by quote characters (").
Corrected Example: MACRO pbsz = "? hbyte(hiword(*(%1-8))) << 5"

Illegal Definition: MACRO tag = "? *(%2-4)"
Explanation: The macro body references parameter %2 without referencing parameter %1. You cannot reference parameter %n+1 without having referenced parameter %n.
Corrected Example: MACRO tag = "? *(%1-4)"
Display a memory map of all 32-bit modules currently loaded in memory.

**Syntax**

For Windows 3.1

MAP32 [module-name | module-handle]

- module-name: Windows module-name.
- module-handle: Base address of a module image.

For Windows 95 and Windows NT

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 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 95

No matter what process/context you are in, you see the same list of drivers because memory above 2GB is globally mapped.

You see different lists of applications/DLLs because they are always private to an address context.
For Windows NT

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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE</td>
<td>Code</td>
</tr>
<tr>
<td>IDATA</td>
<td>Initialized Data</td>
</tr>
<tr>
<td>UDATA</td>
<td>Uninitialized Data</td>
</tr>
<tr>
<td>RO</td>
<td>Read Only</td>
</tr>
<tr>
<td>RW</td>
<td>Read/Write</td>
</tr>
<tr>
<td>SHARED</td>
<td>Object is shared</td>
</tr>
</tbody>
</table>

**Example**

For Windows 3.1

The following example illustrates sample output for MAP32 executed on a Visual C module.

```plaintext
:MAP32 msvcrt10
```

<table>
<thead>
<tr>
<th>Owner</th>
<th>Obj Name</th>
<th>Obj#</th>
<th>Address</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSVCRT10</td>
<td>.text</td>
<td>0001</td>
<td>219F:86CA81000</td>
<td>00024A00</td>
<td>CODE RO</td>
</tr>
<tr>
<td>MSVCRT10</td>
<td>.bss</td>
<td>0002</td>
<td>219F:86CA6000</td>
<td>00001A00</td>
<td>UDATA RW</td>
</tr>
<tr>
<td>MSVCRT10</td>
<td>.rdata</td>
<td>0003</td>
<td>219F:86CA8000</td>
<td>00000200</td>
<td>IDATA RO</td>
</tr>
</tbody>
</table>
SoftICE Commands

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

Display the 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. By obtaining the start of their static code segment (and adding 10h to it if the program is a .EXE) with the MAPV6 command, and setting the symbol table alignment to that value, source level debugging for these global DOS programs is possible.

For Windows NT

The MAPV86 command is process specific. You must be in an NTVDM process because these are the only ones that contain V86 boxes. There is no global MSDOS in Windows NT.

Output

For Windows 3.1 and Windows 95

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:

```plaintext
:MAPV86
ID=01 Handle=80441000 CRS_Ptr=80013390 Linear=80C00000
```

<table>
<thead>
<tr>
<th>Start</th>
<th>Length</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000:0000</td>
<td>0040</td>
<td>Interrupt Vector Table</td>
</tr>
<tr>
<td>0040:0000</td>
<td>0030</td>
<td>ROM BIOS Variables</td>
</tr>
<tr>
<td>0070:0000</td>
<td>025D</td>
<td>I/O System</td>
</tr>
<tr>
<td>02CD:0000</td>
<td>08E6</td>
<td>DOS</td>
</tr>
<tr>
<td>0BB5:0012</td>
<td>0000</td>
<td>NUMEGA</td>
</tr>
<tr>
<td>0C8B:0000</td>
<td>00E8</td>
<td>SOFTICE1</td>
</tr>
<tr>
<td>0D41:0000</td>
<td>00B6</td>
<td>XMSXXXX0</td>
</tr>
<tr>
<td>10D0:0000</td>
<td>038F</td>
<td>SMARTAAR</td>
</tr>
</tbody>
</table>
MOD

Display the Windows 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:

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.

For Windows 95 and Windows NT, refer to MOD on page 139.

pe-header Selector:offset of the PE File header for that module.

Note: A value will only be 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

<table>
<thead>
<tr>
<th>hMod</th>
<th>Module Name</th>
<th>.EXE File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0117</td>
<td>KERNEL</td>
<td>C:\WINDOWS\SYSTEM\KRNL386.EXE</td>
</tr>
<tr>
<td>0147</td>
<td>SYSTEM</td>
<td>C:\WINDOWS\SYSTEM\SYSTEM.DRV</td>
</tr>
<tr>
<td>014F</td>
<td>KEYBOARD</td>
<td>C:\WINDOWS\SYSTEM\KEYBOARD.DRV</td>
</tr>
<tr>
<td>0167</td>
<td>MOUSE</td>
<td>C:\WINDOWS\SYSTEM\LMOUSE.DRV</td>
</tr>
<tr>
<td>01C7</td>
<td>DISPLAY</td>
<td>C:\WINDOWS\SYSTEM\VGA.DRV</td>
</tr>
<tr>
<td>01E7</td>
<td>SOUND</td>
<td>C:\WINDOWS\SYSTEM\MM_SOUND.DRV</td>
</tr>
</tbody>
</table>
SoftICE Commands

<table>
<thead>
<tr>
<th>hMod</th>
<th>PEHeader</th>
<th>Module Name</th>
<th>.EXE File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0237</td>
<td>COMM</td>
<td>C:\WINDOWS\SYSTEM\COMM.DRV</td>
<td></td>
</tr>
<tr>
<td>0000</td>
<td>2987:80756080</td>
<td>W32SKRNL</td>
<td>C:\WINDOWS\SYSTEM\win32s\w32skrn1.dll</td>
</tr>
<tr>
<td>12C7</td>
<td>2987:86C20080</td>
<td>FREECELL</td>
<td>C:\WIN32APP\FREECELL\FREECELL.EXE</td>
</tr>
<tr>
<td>1FC7</td>
<td>2987:86C40080</td>
<td>CARDS</td>
<td>C:\WIN32APP\FREECELL\CARDS.dll</td>
</tr>
<tr>
<td>1FDF</td>
<td>2987:86C70080</td>
<td>w32scomb</td>
<td>C:\WINDOWS\SYSTEM\win32s\w32scomb.dll</td>
</tr>
</tbody>
</table>

See Also For Windows 95 and Windows NT, refer to MOD on page 139.
MOD

Display the Windows 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. If a partial name is specified, only modules that begin with the name will be displayed. SoftICE displays modules in the following order:

- 16-bit modules
- 32-bit driver modules (Windows NT only)
- 32-bit application modules

**For Windows 95**

The module list is global. A module is a Windows application or DLL. All modules have an hMod value.

**For Windows NT**

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 will only be displayed in this column for 32-bit modules.
## SoftICE Commands

**pe-header**
Selector: offset of the PE File header for that module.

*Note:* A value will only be 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 is abbreviated output of MOD used on the NTVDM WOW process:

```plaintext
:MOD
```

<table>
<thead>
<tr>
<th>hMod</th>
<th>Base</th>
<th>PEHeader</th>
<th>ModuleName</th>
<th>File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>021F</td>
<td></td>
<td>KERNEL</td>
<td>D:\WINNT35\SYSTEM32\KRNL386.EXE</td>
<td></td>
</tr>
<tr>
<td>020F</td>
<td></td>
<td>SYSTEM</td>
<td>D:\WINNT35\SYSTEM32\SYSTEM.DRV</td>
<td></td>
</tr>
<tr>
<td>01B7</td>
<td></td>
<td>KEYBOARD</td>
<td>D:\WINNT35\SYSTEM32\KEYBOARD.DRV</td>
<td></td>
</tr>
<tr>
<td>02B7</td>
<td></td>
<td>MOUSE</td>
<td>D:\WINNT35\SYSTEM32\MOUSE.DRV</td>
<td></td>
</tr>
<tr>
<td>02CF</td>
<td></td>
<td>DISPLAY</td>
<td>D:\WINNT35\SYSTEM32\VGA.DRV</td>
<td></td>
</tr>
<tr>
<td>02E7</td>
<td></td>
<td>SOUND</td>
<td>D:\WINNT35\SYSTEM32\SOUND.DRV</td>
<td></td>
</tr>
<tr>
<td>0307</td>
<td></td>
<td>COMM</td>
<td>D:\WINNT35\SYSTEM32\COMM.DRV</td>
<td></td>
</tr>
<tr>
<td>031F</td>
<td></td>
<td>USER</td>
<td>D:\WINNT35\SYSTEM32\USER.EXE</td>
<td></td>
</tr>
<tr>
<td>0397</td>
<td></td>
<td>GDI</td>
<td>D:\WINNT35\SYSTEM32\GDI.EXE</td>
<td></td>
</tr>
<tr>
<td>0347</td>
<td></td>
<td>WOWEXEC</td>
<td>D:\WINNT35\SYSTEM32\WOWEXEC.EXE</td>
<td></td>
</tr>
<tr>
<td>03DF</td>
<td></td>
<td>SHELL</td>
<td>D:\WINNT35\SYSTEM32\SHELL.DLL</td>
<td></td>
</tr>
<tr>
<td>0C3F</td>
<td></td>
<td>WFWNET</td>
<td>D:\WINNT35\SYSTEM32\WFWNET.DRV</td>
<td></td>
</tr>
<tr>
<td>0BF7</td>
<td></td>
<td>MMSYSTEM</td>
<td>D:\WINNT35\SYSTEM32\MMSYSTEM.DLL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>800010000</td>
<td></td>
<td>ntoskrnl</td>
<td>\WINNT35\System32\ntoskrnl.exe</td>
</tr>
<tr>
<td></td>
<td>80100080</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80400000</td>
<td></td>
<td>hal</td>
<td>\WINNT35\System32\hal.dll</td>
</tr>
<tr>
<td></td>
<td>80400080</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80010000</td>
<td></td>
<td>atapi</td>
<td>atapi.sys</td>
</tr>
<tr>
<td></td>
<td>80010080</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80013000</td>
<td></td>
<td>SCSIPORT</td>
<td>\WINNT35\System32\Drivers\SCSIPORT.SYS</td>
</tr>
<tr>
<td></td>
<td>80013080</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80001000</td>
<td></td>
<td>Atdisk</td>
<td>Atdisk.sys</td>
</tr>
</tbody>
</table>
### SoftICE Commands

#### SoftICE Command Reference

<table>
<thead>
<tr>
<th>hMod</th>
<th>Base</th>
<th>PEHeader</th>
<th>ModuleName</th>
<th>File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>8001B000</td>
<td></td>
<td>Scsidisk</td>
<td>Scsidisk.sys</td>
<td></td>
</tr>
<tr>
<td>8001B080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>803AE000</td>
<td></td>
<td>Fastfat</td>
<td>Fastfat.sys</td>
<td></td>
</tr>
<tr>
<td>803AE080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FB000000</td>
<td></td>
<td>Floppy</td>
<td>\SystemRoot\System32\Drivers\Floppy.SYS</td>
<td></td>
</tr>
<tr>
<td>FB000080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FB010000</td>
<td></td>
<td>Scsicdrm</td>
<td>\SystemRoot\System32\Drivers\Scsicdrm.SYS</td>
<td></td>
</tr>
<tr>
<td>FB010080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FB020000</td>
<td></td>
<td>Fs_Rec</td>
<td>\SystemRoot\System32\Drivers\Fs_Rec.SYS</td>
<td></td>
</tr>
<tr>
<td>FB020080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FB030000</td>
<td></td>
<td>Null</td>
<td>\SystemRoot\System32\Drivers\Null.SYS</td>
<td></td>
</tr>
<tr>
<td>FB030080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### See Also

For Windows 3.1, refer to `MOD` on page 137.
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 at 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 194.

**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.

An example of the disassembler output follows. 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.

00 0008:80160D42 params=06 _NtAcceptConnectPort
01 0008:80182B9E params=08 _NtAccessCheck
02 0008:80184234 params=0B _NtAccessCheckAndAuditAlarm
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
Output a value to an I/O port.

**Syntax**

\[O[size] port value\]

<table>
<thead>
<tr>
<th>size</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Dword</td>
<td></td>
</tr>
</tbody>
</table>

**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 outs are done 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**

This command performs an out to port 21, which unmasks all interrupts for interrupt controller one.

\[O 21 0\]
**OBJDIR**

Displays objects in a Windows NT Object Manager's object directory.

**Syntax**

OBJDIR [object-directory-name]

**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 NT-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

<table>
<thead>
<tr>
<th>Object</th>
<th>ObjHdr</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD8CC750</td>
<td>FD8CC728</td>
<td>Beep Device</td>
<td>Device</td>
</tr>
<tr>
<td>FD89A030</td>
<td>FD89A008</td>
<td>NwlndIp</td>
<td>Device</td>
</tr>
<tr>
<td>FD889150</td>
<td>FD889128</td>
<td>Netbios</td>
<td>Device</td>
</tr>
<tr>
<td>FD8979F0</td>
<td>FD8979C8</td>
<td>Ip</td>
<td>Device</td>
</tr>
<tr>
<td>FD8C9ED0</td>
<td>FD8C9EA8</td>
<td>KeyboardClass0</td>
<td>Device</td>
</tr>
<tr>
<td>FD8C5038</td>
<td>FD8C5010</td>
<td>Video0</td>
<td>Device</td>
</tr>
<tr>
<td>FD8C4040</td>
<td>FD8C4018</td>
<td>Video1</td>
<td>Device</td>
</tr>
</tbody>
</table>
```
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

<table>
<thead>
<tr>
<th>Object</th>
<th>ObjHdr</th>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD8D3730</td>
<td>FD8D3708</td>
<td>Partition0</td>
<td>Device</td>
</tr>
<tr>
<td>FD8D3410</td>
<td>FD8D33E8</td>
<td>Partition1</td>
<td>Device</td>
</tr>
<tr>
<td>FD8D32D0</td>
<td>FD8D32A8</td>
<td>Partition2</td>
<td>Device</td>
</tr>
</tbody>
</table>

3 Object(s)

**See Also**  
OBJTAB
OBJTAB

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:
  
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREE</td>
<td>Free handle</td>
</tr>
<tr>
<td>HWND</td>
<td>Hwnd</td>
</tr>
<tr>
<td>Menu</td>
<td>Menu or Sub-menu object</td>
</tr>
<tr>
<td>Icon (or Crsr)</td>
<td>HICON or HCURSOR</td>
</tr>
<tr>
<td>DFRW</td>
<td>DeferWindowPos data</td>
</tr>
<tr>
<td>HOOK</td>
<td>Hook</td>
</tr>
<tr>
<td>TINF</td>
<td>Thread Info data</td>
</tr>
<tr>
<td>QUE (3.51 only)</td>
<td>Message queue</td>
</tr>
<tr>
<td>CPD</td>
<td>Call Proc Data thunk</td>
</tr>
<tr>
<td>ACCL</td>
<td>Accelerator table</td>
</tr>
<tr>
<td>WSTN</td>
<td>Workstation object</td>
</tr>
<tr>
<td>DESK (3.51 only)</td>
<td>Desktop object</td>
</tr>
<tr>
<td>DDE</td>
<td>DDE String</td>
</tr>
</tbody>
</table>

- **-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.
SoftICE Commands

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
```

<table>
<thead>
<tr>
<th>Object</th>
<th>Type</th>
<th>Id</th>
<th>Handle</th>
<th>Owner</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F2D4DA0</td>
<td>Hwnd</td>
<td>01</td>
<td>0004005C</td>
<td>7F2D5F88</td>
<td>00</td>
</tr>
<tr>
<td>7F2D85B8</td>
<td>Menu</td>
<td>02</td>
<td>0001005D</td>
<td>00298B40</td>
<td>00</td>
</tr>
<tr>
<td>7F2D4E58</td>
<td>Hwnd</td>
<td>01</td>
<td>0003005E</td>
<td>7F2D5F88</td>
<td>00</td>
</tr>
<tr>
<td>7F2D1820</td>
<td>Queue</td>
<td>07</td>
<td>0002005F</td>
<td>00000000</td>
<td>00</td>
</tr>
<tr>
<td>003E50E0</td>
<td>Accel. Table</td>
<td>09</td>
<td>00030060</td>
<td>00298B40</td>
<td>00</td>
</tr>
</tbody>
</table>

See Also
OBJDIR
SoftICE Commands

**F10, F12 for P RET**

Execute one program step.

**Syntax**

`P [RET]`

**Use**

The `P` command is 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, a one-time INT 3 style breakpoint execution breakpoint is used.

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 will be displayed with the bold video attribute. For call instructions, this will 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 95 and Windows NT**

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. This prevents the case of Windows NT 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**

To execute one program step, use the command:

```
P
```
**PAGE**

Display page table information.

**Syntax**

```
PAGE  [address  [L length]]
```

*address* Virtual address, segment:offset address, or selector:offset address that you want to know page table information about, including 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 Windows NT.

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 4KB/page * 1024 entries = 4MB of memory, and the page directory maps up to 4MB/page table * 1024 entries = 4GB of memory.

NT 4.0 uses the 4 MB page feature of the Pentium/Pentium Pro processors. NTOSKRNL, HAL, and all boot drivers are mapped into a 4 MB page starting at 2 GB (80000000h).

When the address parameter is specified, 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, 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 a second PAGE command must be used to list the pages starting where the first listing stopped, in the case that fewer entries are listed than you specified.

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 95 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:

<table>
<thead>
<tr>
<th>Windows 3.1, Windows 95, and Windows NT</th>
<th>Windows NT Only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P</strong> Present</td>
<td><strong>S</strong> Supervisor</td>
</tr>
<tr>
<td><strong>D</strong> Dirty</td>
<td><strong>RW</strong> Read/Write</td>
</tr>
<tr>
<td><strong>A</strong> Accessed</td>
<td><strong>4M</strong> 4 MB page (NT 4.0 only)</td>
</tr>
<tr>
<td><strong>U</strong> User</td>
<td></td>
</tr>
<tr>
<td><strong>R</strong> Read Only</td>
<td></td>
</tr>
<tr>
<td><strong>NP</strong> Not Present</td>
<td></td>
</tr>
</tbody>
</table>
type

For Windows 3.1 and Windows 95 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 95**

PAGE with no parameters displays page directory information. The following is a sample PAGE command output:

```
PAGE

Page Directory Physical=002B6000 Linear=006B600

<table>
<thead>
<tr>
<th>Physical</th>
<th>Linear</th>
<th>Attributes</th>
<th>Type</th>
<th>Linear Address Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>002B7000</td>
<td>006B7000</td>
<td>P</td>
<td>A U</td>
<td>System 00000000-003FFFFF</td>
</tr>
<tr>
<td>00109000</td>
<td>00509000</td>
<td>P</td>
<td>A U</td>
<td>System 00400000-007FFFFF</td>
</tr>
<tr>
<td>0010A000</td>
<td>0050A000</td>
<td>P</td>
<td>U</td>
<td>System 00800000-00BFFFFF</td>
</tr>
<tr>
<td>0010B000</td>
<td>0050B000</td>
<td>P</td>
<td>U</td>
<td>System 00C00000-00FFFFFF</td>
</tr>
<tr>
<td>0010C000</td>
<td>0050C000</td>
<td>P</td>
<td>U</td>
<td>System 01000000-013FFFFF</td>
</tr>
<tr>
<td>002B8000</td>
<td>006B8000</td>
<td>P</td>
<td>A U</td>
<td>System 80000000-803FFFFF</td>
</tr>
<tr>
<td>00106000</td>
<td>00506000</td>
<td>P</td>
<td>A U</td>
<td>System 80400000-807FFFFF</td>
</tr>
<tr>
<td>00107000</td>
<td>00507000</td>
<td>P</td>
<td>U</td>
<td>System 80800000-80BFFFFF</td>
</tr>
<tr>
<td>00108000</td>
<td>00508000</td>
<td>P</td>
<td>U</td>
<td>System 80C00000-80FFFFFF</td>
</tr>
<tr>
<td>002B7000</td>
<td>006B7000</td>
<td>P</td>
<td>A U</td>
<td>System 81000000-813FFFFF</td>
</tr>
</tbody>
</table>
```
PAGE with an address specified displays the page table entry that corresponds to that address. In this 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 address.

```
PAGE 00106018 1 3

<table>
<thead>
<tr>
<th>Linear</th>
<th>Physical Attributes</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>00106000</td>
<td>00006000</td>
<td>P</td>
</tr>
<tr>
<td>00107000</td>
<td>00007000</td>
<td>P</td>
</tr>
<tr>
<td>00108000</td>
<td>00008000</td>
<td>P</td>
</tr>
</tbody>
</table>
```

In this example PAGE can be used to find both the virtual and physical address of selector:offset address.

```
PAGE #585:263C

<table>
<thead>
<tr>
<th>Linear</th>
<th>Physical Attributes</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0004A89C</td>
<td>00218442</td>
<td>P</td>
</tr>
</tbody>
</table>
```

**For Windows NT**

When the Page command displays information on either PTEs or PDEs for NT 4.0, 4 MB pages are indicated by a pneumonic 4M in the Attributes field. The following sample output shows the region starting at 2 GB.

```
:PAGE
Page Directory   Physical=00030000

<table>
<thead>
<tr>
<th>Physical</th>
<th>Attributes</th>
<th>Linear Address Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000000</td>
<td>P A S RW 4M</td>
<td>80000000 - 803FFFFF</td>
</tr>
<tr>
<td>00400000</td>
<td>P A S RW 4M</td>
<td>80400000 - 807FFFFF</td>
</tr>
<tr>
<td>00800000</td>
<td>P A S RW 4M</td>
<td>80800000 - 80BFFFFF</td>
</tr>
<tr>
<td>00C00000</td>
<td>P A S RW 4M</td>
<td>80C00000 - 80FFFFFF</td>
</tr>
<tr>
<td>01034000</td>
<td>P A S RW 4M</td>
<td>81000000 - 813FFFFF</td>
</tr>
</tbody>
</table>
```
The following example is a partial listing of output from the PAGE command being executed without parameters on Windows NT 3.51 so that the page directory contents are printed.

```
:PAGE
Page Directory Physical=00030000

Physical Attributes Linear Address Range
00380000 P A U RW 00000000 - 003FFFFF
00611000 P A U RW 77C00000 - 77FFFFFF
00610000 P A U RW 7FC00000 - 7FFFFFFF
00032000 P A S RW 80000000 - 803FFFFF
00034000 P A S RW 80400000 - 807FFFFF
00035000 P A S RW 80800000 - 80BFFFFF
00033000 P A S RW 80C00000 - 80FFFFFF
00030000 P A S RW C0000000 - C03FFFFF
00040000 P A S RW C0400000 - C07FFFFF
00001000 P A S RW C0C00000 - C0FFFFFF
```

Here is an example of the PAGE command being used to display the attributes and addresses of the page that instructions are currently being executed from.

```
:PAGE eip

Linear Physical Attributes
80404292 00404292 P D A S RW
```
PAUSE

Windows 3.1, Windows 95, Windows 98, Windows NT
Customization

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 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

Dump the configuration registers for each PCI device in the system.

**Syntax**

PCI

**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 example illustrates a partial sample output for the PCI command:

```
 PCI
 Bus 00 Device 00 Function00
 Vendor: 8086 Intel
 Device: 1237
 Revision: 02
 Device class: 06 Bridge device
 Device subclass: 00 Host bridge
 Device sub subclass: 00
 Interrupt line: 00 Interrupt pin: 00 Min_Gnt: 00 MaxLat: 00
 Cache line size: 00 Latency timer: 40 Header type: 00BIST: 00
 I/O:0 Mem:1 BusMAST:1 Special:0 MemInv:0
 Parity:0 Wait:0 SERR:1 Back2Back:0 Snoop:0
 Bus 00 Device 07 Function00
 Vendor: 8086 Intel
 Device: 7000
 Revision: 01
 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: 80BIST: 00
 I/O:1 Mem:1 BusMAST:1 Special:1 MemInv:0
 Parity:0 Wait:0 SERR:0 Back2Back:0 Snoop:0
```
**PEEK**

Windows 95, Windows 98, Windows NT  
Display/Change Memory

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**

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 95 and Windows NT**

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. In this example there are three different virtual addresses that correspond to physical A0000 as shown:

```
:PHYS a0000

000A0000
004A0000
80CA0000
```
POKE

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

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 to a printer, choose Save SoftICE History from the File menu in the SoftICE Loader to write the SoftICE command line window history to a file.

For Windows 95 and Windows NT

From a DOS VM, use the DLOG.EXE utility to log the SoftICE Command window information.

See Also

PRN
PRN

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

This command causes Print Screen output to go to the COM1 port.

```
PRN com1
```
PROC

Display summary information about any or all processes in the system.

Syntax

For Windows 95

PROC [-xo] [task]

For Windows NT

PROC [[-xom] process-type | thread-type]

-Extended Display extended information for each thread.
-Objects Display list of objects in processes handle table.
-Memory 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 specify PROC with no options, summary information is presented for one or all processes in the system. The information the -Memory option provides is also included when you specify the -Extended option for Windows NT. It 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 displays the object pointer, the object handle, and the object type for every object in the processes object handle table. Because object information is allocated from the systems pageable pool, the objects type name will not always be available. In this case, question marks (???) are displayed.
Output

For Windows 95

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 Windows NT

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.
- **Krln 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 95

This example lists all the processes in the system.

:PROC

<table>
<thead>
<tr>
<th>Process</th>
<th>pProcess</th>
<th>ProcessID</th>
<th>Threads</th>
<th>Context</th>
<th>DefHeap</th>
<th>DebuggeeCB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winword</td>
<td>8156ACA8</td>
<td>FFFCSB17</td>
<td>00000001</td>
<td>C10474D4</td>
<td>00400000</td>
<td>00000000</td>
</tr>
<tr>
<td>Gdidemo</td>
<td>81569F04</td>
<td>FFFCBBBB</td>
<td>00000001</td>
<td>C1033E38</td>
<td>00410000</td>
<td>00000000</td>
</tr>
<tr>
<td>Loader32</td>
<td>8156630C</td>
<td>FFFC47B3</td>
<td>00000001</td>
<td>C10476D0</td>
<td>00470000</td>
<td>00000000</td>
</tr>
<tr>
<td>Explorer</td>
<td>8156140C</td>
<td>FFFC307F</td>
<td>00000002</td>
<td>C104577C</td>
<td>00440000</td>
<td>00000000</td>
</tr>
<tr>
<td>Mprexe</td>
<td>8155DF4A</td>
<td>FFFFB1B</td>
<td>00000002</td>
<td>C1043340</td>
<td>00510000</td>
<td>00000000</td>
</tr>
<tr>
<td>MSGSRV32</td>
<td>8155DD18</td>
<td>FFFFA7</td>
<td>00000001</td>
<td>C1041E28</td>
<td>00400000</td>
<td>00000000</td>
</tr>
<tr>
<td>KERNEL32</td>
<td>8165A13C</td>
<td>FFFFC87A3</td>
<td>00000004</td>
<td>C10D9EDC</td>
<td>00640000</td>
<td>00000000</td>
</tr>
</tbody>
</table>

This example shows extended information for GDIDEMO:

:PROC -x gdidemo

Process Information for Gdidemo at 81569F04

Type: 00000005 RefCount: 00000002 Unknown1: 00000000
pEvent: 81569FC8 TermStatus: 00000010 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

This example shows a partial listing of the objects in Kernel32:

```
:PROC -o kernel32
```

<table>
<thead>
<tr>
<th>Handle</th>
<th>Object</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8165A32C</td>
<td>Process</td>
</tr>
<tr>
<td>2</td>
<td>8155BFFC</td>
<td>Event</td>
</tr>
<tr>
<td>3</td>
<td>C103E3A4</td>
<td>Memory Mapped file</td>
</tr>
<tr>
<td>4</td>
<td>C0FFE0E0</td>
<td>Memory Mapped file</td>
</tr>
<tr>
<td>5</td>
<td>C0FFE22C</td>
<td>Memory Mapped file</td>
</tr>
<tr>
<td>6</td>
<td>C0FF1058</td>
<td>Memory Mapped file</td>
</tr>
<tr>
<td>7</td>
<td>8155C01C</td>
<td>Event</td>
</tr>
<tr>
<td>8</td>
<td>8155CCE4</td>
<td>Event</td>
</tr>
<tr>
<td>9</td>
<td>8155CD5C</td>
<td>Event</td>
</tr>
<tr>
<td>A</td>
<td>8155CD8C</td>
<td>Thread</td>
</tr>
<tr>
<td>B</td>
<td>8155D008</td>
<td>Event</td>
</tr>
<tr>
<td>C</td>
<td>C1041C04</td>
<td>Memory Mapped file</td>
</tr>
<tr>
<td>D</td>
<td>8155D870</td>
<td>Event</td>
</tr>
</tbody>
</table>
For Windows NT

The following is an example using the PROC command without parameters:

```
:PROC
```

<table>
<thead>
<tr>
<th>Process</th>
<th>KPEB</th>
<th>PID</th>
<th>Threads</th>
<th>Pri</th>
<th>User Time</th>
<th>Krnl Time</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>FD8E0020</td>
<td>2</td>
<td>14</td>
<td>8</td>
<td>00000000</td>
<td>0001A48</td>
<td>Ready</td>
</tr>
<tr>
<td>smss</td>
<td>FD8B9020</td>
<td>13</td>
<td>6</td>
<td>B</td>
<td>00000022</td>
<td>00000022</td>
<td>Swapped</td>
</tr>
<tr>
<td>csrss</td>
<td>FD8B3DC0</td>
<td>1F</td>
<td>12</td>
<td>D</td>
<td>00B416C5</td>
<td>00049C4E</td>
<td>Ready</td>
</tr>
<tr>
<td>winlogon</td>
<td>FD8AD020</td>
<td>19</td>
<td>2</td>
<td>D</td>
<td>00000028</td>
<td>00000072</td>
<td>Idle</td>
</tr>
<tr>
<td>services</td>
<td>FD8A6880</td>
<td>28</td>
<td>B</td>
<td>9</td>
<td>0000018E</td>
<td>0000055A</td>
<td>Idle</td>
</tr>
<tr>
<td>lsass</td>
<td>FD8A4020</td>
<td>2A</td>
<td>C</td>
<td>9</td>
<td>000001B</td>
<td>0000058</td>
<td>Idle</td>
</tr>
<tr>
<td>spoolss</td>
<td>FD87ACA0</td>
<td>43</td>
<td>6</td>
<td>8</td>
<td>000000AB</td>
<td>000000BD</td>
<td>Idle</td>
</tr>
<tr>
<td>nddeagnt</td>
<td>FD872780</td>
<td>4A</td>
<td>1</td>
<td>8</td>
<td>00000004</td>
<td>000000C</td>
<td>Idle</td>
</tr>
<tr>
<td>*ntvdm</td>
<td>FD86D0C0</td>
<td>50</td>
<td>6</td>
<td>9</td>
<td>00125B98</td>
<td>0003C0BE</td>
<td>Running</td>
</tr>
<tr>
<td>scm</td>
<td>FD85B300</td>
<td>5D</td>
<td>3</td>
<td>8</td>
<td>0000024</td>
<td>000008A</td>
<td>Idle</td>
</tr>
<tr>
<td>Explorer</td>
<td>FD850020</td>
<td>60</td>
<td>3</td>
<td>D</td>
<td>000002DE</td>
<td>00000447</td>
<td>Ready</td>
</tr>
<tr>
<td>Idle</td>
<td>8016A9E0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>00000000</td>
<td>00135D03</td>
<td>Ready</td>
</tr>
</tbody>
</table>

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 is an example of using the -eXtended option for a specific process, in this case 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: 00000000 Peak Usage: 00000151 Limit: 00000000

---- Handle Table Information ----
Handle Table: E10CE5E8 Handle Array: E1265D48 Entries: 50
QUERY

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 a single process's virtual address space 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 95

Under Windows 95, 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, Free, or Reserve.
  - 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 Windows NT

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 will show the name of the mapped file.
  • Executable modules will show the file name of the DLL or EXE.
  • Stacks will be displayed as STACK(thread ID).
  • Thread information blocks will be displayed as TIB(thread ID).
  • Any address that the WHAT command can identify may also appear.
Example

Windows 95

The following example uses the QUERY command with no parameters to display a partial listing of the map for the current process, GDIDEMO:

```
: QUERY
```

<table>
<thead>
<tr>
<th>Base</th>
<th>AllocBase</th>
<th>AllocProt</th>
<th>Size</th>
<th>State</th>
<th>Protect</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>400000</td>
<td>Free</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>400000</td>
<td>400000</td>
<td>1</td>
<td>7000</td>
<td>Commit</td>
<td>RO</td>
<td>GDIDEMO</td>
</tr>
<tr>
<td>407000</td>
<td>400000</td>
<td>1</td>
<td>2000</td>
<td>Commit</td>
<td>RW</td>
<td>GDIDEMO</td>
</tr>
<tr>
<td>409000</td>
<td>400000</td>
<td>1</td>
<td>2000</td>
<td>Commit</td>
<td>RO</td>
<td>GDIDEMO</td>
</tr>
<tr>
<td>40B000</td>
<td>400000</td>
<td>1</td>
<td>5000</td>
<td>Reserve</td>
<td>NA</td>
<td>GDIDEMO</td>
</tr>
<tr>
<td>410000</td>
<td>410000</td>
<td>1</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td>Heap 32</td>
</tr>
<tr>
<td>411000</td>
<td>410000</td>
<td>1</td>
<td>FF000</td>
<td>Reserve</td>
<td>NA</td>
<td>Heap 32</td>
</tr>
<tr>
<td>510000</td>
<td>410000</td>
<td>1</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td>Heap 32</td>
</tr>
<tr>
<td>511000</td>
<td>410000</td>
<td>1</td>
<td>F000</td>
<td>Reserve</td>
<td>NA</td>
<td>Heap 32</td>
</tr>
<tr>
<td>520000</td>
<td>520000</td>
<td>4</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td></td>
</tr>
<tr>
<td>521000</td>
<td>520000</td>
<td>4</td>
<td>F000</td>
<td>Reserve</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

The following example shows every context where base address 416000 is valid:

```
: QUERY -x 416000
```

<table>
<thead>
<tr>
<th>Base</th>
<th>AllocBase</th>
<th>AllocProt</th>
<th>Size</th>
<th>State</th>
<th>Protect</th>
<th>Owner</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>416000</td>
<td>400000</td>
<td>1</td>
<td>F1000</td>
<td>Reserve</td>
<td>NA</td>
<td>KERNEL32</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>400000</td>
<td>1</td>
<td>E9000</td>
<td>Reserve</td>
<td>NA</td>
<td>MSGSRV32</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>400000</td>
<td>1</td>
<td>D000</td>
<td>Commit</td>
<td>RO</td>
<td>EXPLORER</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>410000</td>
<td>1</td>
<td>F9000</td>
<td>Reserve</td>
<td>NA</td>
<td>WINFILE</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>400000</td>
<td>1</td>
<td>2000</td>
<td>Commit</td>
<td>RO</td>
<td>CONSOLE</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>400000</td>
<td>1</td>
<td>E9000</td>
<td>Reserve</td>
<td>NA</td>
<td>WINOLDAP</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>410000</td>
<td>0</td>
<td>EA000</td>
<td>Free</td>
<td>NA</td>
<td>Mprexe</td>
<td></td>
</tr>
<tr>
<td>416000</td>
<td>410000</td>
<td>1</td>
<td>FA000</td>
<td>Reserve</td>
<td>NA</td>
<td>Spool32</td>
<td></td>
</tr>
</tbody>
</table>
The following example shows a partial listing of the virtual address map for Explorer:

```
: QUERY EXPLORER
```

<table>
<thead>
<tr>
<th>Base</th>
<th>AllocBase</th>
<th>AllocProt</th>
<th>Size</th>
<th>State</th>
<th>Protect</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>400000</td>
<td>Free</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>400000</td>
<td>400000</td>
<td>1</td>
<td>23000</td>
<td>Commit</td>
<td>RO</td>
<td>EXPLORER</td>
</tr>
<tr>
<td>423000</td>
<td>400000</td>
<td>1</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td>EXPLORER</td>
</tr>
<tr>
<td>424000</td>
<td>400000</td>
<td>1</td>
<td>11000</td>
<td>Commit</td>
<td>RO</td>
<td>EXPLORER</td>
</tr>
<tr>
<td>435000</td>
<td>400000</td>
<td>1</td>
<td>B000</td>
<td>Reserve</td>
<td>NA</td>
<td>EXPLORER</td>
</tr>
<tr>
<td>440000</td>
<td>440000</td>
<td>1</td>
<td>9000</td>
<td>Commit</td>
<td>RW</td>
<td>Heap32</td>
</tr>
<tr>
<td>449000</td>
<td>440000</td>
<td>1</td>
<td>F7000</td>
<td>Reserve</td>
<td>NA</td>
<td>Heap32</td>
</tr>
<tr>
<td>540000</td>
<td>440000</td>
<td>1</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td>Heap32</td>
</tr>
<tr>
<td>541000</td>
<td>440000</td>
<td>1</td>
<td>F000</td>
<td>Reserve</td>
<td>NA</td>
<td>Heap32</td>
</tr>
<tr>
<td>550000</td>
<td>550000</td>
<td>4</td>
<td>1000</td>
<td>Commit</td>
<td>RW</td>
<td></td>
</tr>
<tr>
<td>551000</td>
<td>550000</td>
<td>4</td>
<td>F000</td>
<td>Reserve</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>560000</td>
<td>560000</td>
<td>1</td>
<td>106000</td>
<td>Reserve</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

**Windows NT**

The following example uses the QUERY command to map a specific linear address for Windows NT:

```
: QUERY 7f2d0123
```

<table>
<thead>
<tr>
<th>Context</th>
<th>Address Range</th>
<th>Flags</th>
<th>MMCI</th>
<th>PTE</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>csrss</td>
<td>7F2D0000-7F5CFFFF</td>
<td>060000000</td>
<td>FD8AC128</td>
<td>E1191068</td>
<td>Heap #07</td>
</tr>
</tbody>
</table>
SoftICE Commands

The following example uses the QUERY command to list the address map of the PROGMAN process for Windows NT:

```
:QUERY progman
```

<table>
<thead>
<tr>
<th>Address Range</th>
<th>Flags</th>
<th>MMCI</th>
<th>PTE</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>00010000-00010FFF</td>
<td>C4000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00020000-00020FFF</td>
<td>C4000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00030000-0012FFFF</td>
<td>84000004</td>
<td></td>
<td></td>
<td>STACK(6E)</td>
</tr>
<tr>
<td>00130000-00130FFF</td>
<td>C4000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00140000-0023FFFF</td>
<td>84000002D</td>
<td>Heap #01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00240000-0024FFFF</td>
<td>04000000</td>
<td>FF0960C8</td>
<td>E1249948</td>
<td>Heap #02</td>
</tr>
<tr>
<td>00250000-0025FFFF</td>
<td>01800000</td>
<td>FF0E8088</td>
<td>E11B9068</td>
<td>unicodex.js</td>
</tr>
<tr>
<td>00260000-0026FFFF</td>
<td>01800000</td>
<td>FF0E7F68</td>
<td>E11BBD88</td>
<td>locale.js</td>
</tr>
<tr>
<td>00270000-0028FFFF</td>
<td>01800000</td>
<td>FF0E7C68</td>
<td>E11B6688</td>
<td>sortkey.js</td>
</tr>
<tr>
<td>002C0000-002DFFFF</td>
<td>01800000</td>
<td>FF0E7AE8</td>
<td>E11BBA08</td>
<td>sortbls.js</td>
</tr>
<tr>
<td>002E0000-0035FFFF</td>
<td>84000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00360000-00360FFF</td>
<td>C4000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00470000-0047FFFF</td>
<td>04000000</td>
<td>FF0D4E8</td>
<td>E124AA8</td>
<td></td>
</tr>
<tr>
<td>00480000-0048FFFF</td>
<td>01800000</td>
<td>FF0E7DE8</td>
<td>E110C6E8</td>
<td>ctype.js</td>
</tr>
<tr>
<td>01A00000-01A30FFF</td>
<td>07300000</td>
<td>FF097AC8</td>
<td>E1246448</td>
<td>progman.js</td>
</tr>
<tr>
<td>77DE0000-77DEFFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77DE0000-77DEFFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E20000-07E3FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E20000-07E3FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E60000-07E7FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E60000-07E7FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E70000-07E9FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77E70000-07E9FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F00000-07F0FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F00000-07F0FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F10000-07F1FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F10000-07F1FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F20000-07F2FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F20000-07F2FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F30000-07F3FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F30000-07F3FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F40000-07F4FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F40000-07F4FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F50000-07F5FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>77F50000-07F5FFFF</td>
<td>07300000</td>
<td>FF0F7AC8</td>
<td>E110B398</td>
<td>shell32.js</td>
</tr>
<tr>
<td>7FF70000-0FFAFFF</td>
<td>84000001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7F8B0000-07FD3FFF</td>
<td>01600000</td>
<td>FF116288</td>
<td>E1000188</td>
<td>Ansi Code Page</td>
</tr>
<tr>
<td>7FFD0000-07FDFFFF</td>
<td>C4000001</td>
<td>TIB(2E)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7FFD0000-07FDFFFF</td>
<td>C4000001</td>
<td>TIB(6E)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7FFD0000-07FDFFFF</td>
<td>C4000001</td>
<td>TIB(2E)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7FFD0000-07FDFFFF</td>
<td>C4000001</td>
<td>TIB(6E)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Display or change the register values.

**Syntax**

**For Windows 3.1**

```
R [register-name [ [=] value ]]
```

**For Windows 95 and Windows NT**

```
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:
  - O (Overflow flag)
  - 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**

This example sets the AH register equal to 5.

```
R ah=5
```

This example toggles the O, Z, and P flag values.

```
R fl=ozp
```

This example moves the cursor into the Register window position under the first flag field.

```
R fl
```

This example toggles the O flag value, turns on the A flag value, and turns off the C flag value.

```
R fl=o+a-c
```
SOFTICE COMMANDS

RS

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.
Search memory for data.

**Syntax**

For Windows 3.1

\[ S \ [address\ L\ length\ data-list] \]

For Windows 95 and Windows NT

\[ S \ [-cu]\ [address\ L\ length\ data-list] \]

<table>
<thead>
<tr>
<th><strong>address</strong></th>
<th>Starting address for search.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>length</strong></td>
<td>Length in bytes.</td>
</tr>
<tr>
<td><strong>data-list</strong></td>
<td>List of bytes or quoted strings separated by commas or spaces. A quoted string can be enclosed with single or double quotes.</td>
</tr>
</tbody>
</table>

- **-c** Make search case-insensitive.

- **-u** Search for Unicode string.

**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 95: 30h, Windows NT: 10h).

**Example**

This 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.

\[ S\ es:di+10\ L\ ecx\ 'Hello',12,34 \]
This example searches the entire 4GB virtual address range for 'string'.

S 30:0 L ffffffff 'string'
SERIAL

Redirect console to serial terminal.

Syntax

SERIAL [on [com-port] [baud-rate] | off]

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, 57600, 115000.

Use

Use the SERIAL command to establish a remote debugging session through a serial port (refer to DIAL on page 67 for establishing remote sessions over a modem). Remote debugging requires a second IBM-compatible PC running MS-DOS. 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 SERIAL.EXE program on the remote machine.

The syntax for the SERIAL.EXE program is the same as the syntax of the SERIAL command, so the following information is applicable to both.

The SERIAL command has two optional parameters. The first parameter specifies the com-port through which the connection will be made (on the machine where the command is entered). If no com-port is specified, com-port 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.

When a connection is established between a remote machine and a local machine, the user of the remote machine is presented with the same SoftICE interface they would see if they were debugging on the local machine. The display on the local machine is restored to the Windows screen while the connection is maintained.
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\text{n} keyword on a separate line in the WINICE.DAT file to reserve a specific COM port for the serial connection. The \text{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. To set Com 2 as the serial port, use:

\texttt{Com2}

For Windows 95

Select the desired com port in the remote debugging initialization settings within Symbol Loader.

Example

On the remote machine:

\texttt{SERIAL.EXE on 19200}

On the local machine:

\texttt{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

SET

Display or change the state of an internal variable.

Syntax

SET [keyword] [on | off] value

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:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTSCR</td>
<td>[onoff]</td>
</tr>
<tr>
<td>BUTTONREVERSE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>CASESENSITIVE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>CODE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>EXCLUDE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>FAULTS</td>
<td>[onoff]</td>
</tr>
<tr>
<td>FLASH</td>
<td>[onoff]</td>
</tr>
<tr>
<td>FONT</td>
<td>[1</td>
</tr>
<tr>
<td>FORCEPALETTE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>I1HERE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>I3HERE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>LOWERCASE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>MOUSE</td>
<td>[onoff] [1</td>
</tr>
<tr>
<td>ORIGIN</td>
<td>x y</td>
</tr>
<tr>
<td>PAUSE</td>
<td>[onoff]</td>
</tr>
<tr>
<td>SYMBOLS</td>
<td>[onoff]</td>
</tr>
</tbody>
</table>
SET CASESENSITIVE ON makes global and local symbol names case sensitive. Enter them exactly as displayed by the SYM command.

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.

### Example

The following example enables SoftICE fault trapping:

```plaintext
SET faults on
```

The following example sets the mouse to the fastest speed:

```plaintext
SET mouse 3
```

### See Also

ALTSCR, CODE, FAULTS, FLASH, I1HERE, I3HERE, THREADP
SHOW Ctrl-F11

Display instructions from the back trace history buffer.

**Syntax**

```
SHOW [B | start] [l length]
```

- **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.

All instructions and source are displayed 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.

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 specifying a range breakpoint.

**Example**

This command starts displaying instructions in the Command window, starting at the oldest instruction in the back trace history buffer.

```
SHOW B
```

**See Also**

BPR
SoftICE Commands

**SRC**  
*Windows 3.1, Windows 95, Windows 98, Windows NT*  
*Symbol/Source*

F3

Toggle between displaying source, mixed, and code in the Code window.

**Syntax**  
`SRC`

**Use**  
Use the SRC command to toggle among the following modes in the Code window: source mode, mixed mode, and code mode.

*Hint:* Use F3 to toggle modes quickly.

**Example**  
The following example changes the current mode of the Code window:

`SRC`
SS

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**

Display a call stack.

**Syntax**

For Windows 3.1 and Windows 95

```
STACK [task-name | SS:[E]BP]
```

- `task-name`: Name of the task as displayed by the TASK command.

For Windows NT

```
STACK [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 Windows NT, 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. 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 the current symbol table. If the routine is not in the symbol table, the export list and module name list are searched for nearby symbols. If stack variables are present, they are displayed as well.
The STACK command works in 32-bit code, however, since 32-bit symbol information support is limited to that provided in .SYM files, local variables cannot be shown. 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 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 95, the call stack is not followed through thunks or ring transitions, but under Windows NT it is.

**For Windows 3.1 and Windows 95**

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.

**Output**

Each entry of the call stack 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
Example

This is the output of the STACK command 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
```

This is an example of the STACK command in 32-bit mode. Execution has been stopped within the C library DLL's memset routine:

```
:STACK
W32SCOMB!DispatchCB32+01FF at 2197:86C5003B
  UTSAMP!.text+01A4 at 2197:86C211A4
  _MyGetFreeSpace80+0016 at 2197:86C7113B
  => MSVCRT10!memset+0005 at 2197:86C94F89
```
**SYM**

**Windows 3.1, Windows 95, Windows 98, Windows NT**  
**Symbol/Source**

Display or set symbol.

**Syntax**

SYM ![section-name] ! symbol-name [value]

- **section-name**: Valid section-name. Also can be a partial section-name. This allows displaying symbols in a particular section. If 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**: 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**: Value that 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 section-name! precedes symbol-name or asterisk (*), only symbols from the specified section are shown.

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 symbol-name ends with an asterisk (*), all symbols that match the actual characters typed prior to the asterisk display, regardless of their ending characters. If you use a comma (,) in place of a specific character in 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.

If you place an address between square brackets as a parameter to the SYM command, the closest symbol above and below the address display.
**Example**

All symbols that start with FOO display.

`SYM foo*`

All symbols that start with FOO are given the address 6000.

`SYM foo* 6000`

All sections for the current symbol table display.

`SYM !`

All symbols in section MAIN that start with FOO display.

`SYM main!foo*`
SYMLOC

Relocate the symbol base.

Syntax

For Windows 3.1

SYMLOC [segment-address | o | r | (section-number selector linear-address)]

For Windows 95 and Windows NT

SYMLOC [segment-address | o | r | -c process-type | (section-number selector linear-address)]

*segment address*  
Only use to relocate 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 a 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 95 and Windows NT

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 under Windows NT 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**

Windows 3.1, Windows 95, Windows 98, Windows NT

**Flow Control**

Trace one instruction.

**Syntax**

\[ T \ [=\text{start-address}] \ [\text{count}] \]

*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**

This example single steps through eight instructions starting at memory location CS:1112.

\[ T = cs:1112 \ 8 \]
**TABLE**

Change or display the current symbol table.

**Syntax**

**For Windows 3.1**

```
TABLE [[r] partial-table-name] | autoon | autooff | $
```

**For Windows 95 and Windows NT**

```
TABLE [partial-table-name] | autoon | autooff | $
```

- `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 device drivers, DOS programs, DOS loadable device drivers, and TSRs.

Symbols are only accessible from one symbol table at a 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. This will cause the current table to become whichever 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 `partial-table-name`, the specified table is removed. Specifying an “*” after the R parameter removes all symbol tables.
For Windows 95 and Windows NT

Symbol tables can be tied to an address context or multiple address contexts. If a table is tied to a 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 SoftICE Loader to remove tables from memory. The R parameter is not supported.

Example

Since no parameters are specified in the following command, all loaded symbol tables are listed. 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
```
TABS

Display or set the tab settings for source display.

Syntax

TABS [tab-setting]

tab-setting Number from 1 through 8 that specifies how many columns between tab stops.

Use

Use the TABS command to display or set tab-settings for the display of source files. Tab stops can be anywhere from 1 to 8 columns. The default TABS setting is 8. TABS with no parameters display the current tab-setting. Specifying a tab-setting of 1 allows the most source to be viewed since each tab will be replaced by a single space.

Example

This example causes the tabs setting to change to every fourth column starting at the first display column.

TABS 4
TASK

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 Windows NT

The `TASK` command is process specific and only shows 16-bit tasks under Windows NT. In addition, it is only useful when the current context is that of an NTVDM process containing a WOW box. To view information or processes, refer to `PROC` on page 162.

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 95

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.
SoftICE Commands

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 at the same memory as does the flat 32-bit pointer used with the 32-bit data selector.

Example
The following example shows the TASK command on Windows 3.1 running Win32s and its output.

: TASK

<table>
<thead>
<tr>
<th>TaskNm</th>
<th>SS:SP</th>
<th>StackTop</th>
<th>StackBot</th>
<th>Low</th>
<th>TaskDB</th>
<th>hQueue</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREECELL</td>
<td>21BF:7D96</td>
<td>86CE0000</td>
<td>86D00000</td>
<td>10FF</td>
<td>121F</td>
<td>0000</td>
<td></td>
</tr>
<tr>
<td>PROGMAN</td>
<td>17A7:200A</td>
<td>0936</td>
<td>2070</td>
<td>14CE</td>
<td>064F</td>
<td>07D7</td>
<td>0000</td>
</tr>
<tr>
<td>CLOCK</td>
<td>1427:1916</td>
<td>02E4</td>
<td>1A4E</td>
<td>143E</td>
<td>144F</td>
<td>1437</td>
<td>0000</td>
</tr>
<tr>
<td>MSWORD</td>
<td>* 29AF:913E</td>
<td>5956</td>
<td>93A4</td>
<td>7ADE</td>
<td>1F67</td>
<td>1F47</td>
<td>0000</td>
</tr>
</tbody>
</table>
THREAD

Display thread information.

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

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.

For Windows NT, refer to THREAD on page 201.

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.
SoftICE Commands

If you specify TCB or ID, this information displays for the thread with that 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

This example displays the thread that belongs to the Winword process:

:THREAD

<table>
<thead>
<tr>
<th>Ring0TCB ID</th>
<th>Context</th>
<th>Ring3TCB</th>
<th>ThreadID</th>
<th>Process</th>
<th>TaskDB</th>
<th>PDB</th>
<th>SZ</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1051808</td>
<td>008B</td>
<td>C104B990</td>
<td>815842CC</td>
<td>FFF0671F</td>
<td>8158AAA8</td>
<td>274E</td>
<td>25B7</td>
<td>*Winword</td>
</tr>
</tbody>
</table>

The following example shows abbreviated information about the thread with ID 8B.

:THREAD 8B

<table>
<thead>
<tr>
<th>Ring0TCB ID</th>
<th>Context</th>
<th>Ring3TCB</th>
<th>ThreadID</th>
<th>Process</th>
<th>TaskDB</th>
<th>PDB</th>
<th>SZ</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1051808</td>
<td>008B</td>
<td>C104B990</td>
<td>815842CC</td>
<td>FFF0671F</td>
<td>8158AAA8</td>
<td>274E</td>
<td>25B7</td>
<td>*Winword</td>
</tr>
</tbody>
</table>

CS:SIIP=0137:BFF96868 SS:ESP=013F:0062FC3C DS=013F ES=013F FS=2EBF GS=0000
EDAX=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

For Windows NT, refer to THREAD on page 201.
 THREAD

Display information about a thread.

Syntax

THREAD [−r | −x | −u] [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.
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.

For the -R and -X options, the registers shown are those that are saved on 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.
Many fields of thread environment blocks are shown when extended output is specified, with most being self-explanatory. Some 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
```

<table>
<thead>
<tr>
<th>TID</th>
<th>Krnl TEB</th>
<th>StackBtm</th>
<th>StkTop</th>
<th>StackPtr</th>
<th>User TEB</th>
<th>Process(4d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>006A</td>
<td>FD857DA0</td>
<td>FB1C0000</td>
<td>FB1C0000</td>
<td>FB1C2D8</td>
<td>7FFDE000</td>
<td>Explorer(6B)</td>
</tr>
<tr>
<td>006F</td>
<td>FD854620</td>
<td>FB235000</td>
<td>FB237000</td>
<td>FB1C3B2C</td>
<td>7FFD0000</td>
<td>Explorer(6B)</td>
</tr>
<tr>
<td>007C</td>
<td>FD840020</td>
<td>FD72F000</td>
<td>FD731000</td>
<td>FD730E24</td>
<td>7FFD8000</td>
<td>Explorer(6B)</td>
</tr>
</tbody>
</table>

This 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(6B)
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 (6D60744C)
Affinity:  00000001  Context Flags:  A
KSS EBP:  FB1C3F04  Callback ESP:  00000000
Kernel Stack:  FB1C0000 - FB1C4000  Stack Ptr:  FB1C3ED8
User Stack:  00003000 - 00130000  Stack Ptr:  0012FE3C
Kernel Time:  00000014A  User Time:  0000015F
Create Time:  01BB20646A2DBE90
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

For Windows 95, refer to THREAD on page 199.
TRACE

Windows 3.1, Windows 95, Windows 98

CTRL-F9, TRACE B, CTRL-F12

Enter or exit Trace simulation mode.

Syntax

TRACE [b | off | start]

start

Hexadecimal number specifying the index within the back trace history buffer to start tracing from. 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 on the bottom of the screen shows this, as well as 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

This example enters trace simulation mode starting at the eighth instruction in the back trace history buffer.

TRACE 8

See Also

BPR, BPRW, SHOW
TSS

Display task state segment and I/O port hooks.

Syntax

**For Windows 3.1**

TSS

**For Windows 95 and Windows NT**

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
- selector base
- selector limit

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 95**

Next, the TSS bit mask array is printed, which 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
- 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 will be displayed; otherwise the name of the VxD followed by the handler’s offset within the VxD will be displayed.

**For Windows 95 and Windows NT**

The I/O permission map base and size are also displayed. 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 (output of the bit mask array is abbreviated).

```
:TS
TR=0018  BASE=C000AEBC  LIMIT=2069
LDT=0000  GS=0000  FS=0000  SS=0000  CS=0000  ES=0000  CR3=00000000
EAX=00000000  EBX=00000000  ECX=00000000  EDX=00000000  EIP=00000000
EDX=00000000  ESI=00000000  EDI=00000000  EBP=00000000  ESP=00000000
SS0=0030:C3EEFA8  SS1=0000:00000000  SS2=0000:00000000
I/O Map Base=0068  I/O Map Size=2000
```

<table>
<thead>
<tr>
<th>Port</th>
<th>Handler</th>
<th>Trapped</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>C00C3E92</td>
<td>Yes</td>
<td>VDMAD (01) +17BA</td>
</tr>
<tr>
<td>0001</td>
<td>C00C3F0E</td>
<td>Yes</td>
<td>VDMAD (01) +1836</td>
</tr>
<tr>
<td>0002</td>
<td>C00C3E92</td>
<td>Yes</td>
<td>VDMAD (01) +17BA</td>
</tr>
<tr>
<td>0003</td>
<td>C00C3F0E</td>
<td>Yes</td>
<td>VDMAD (01) +1836</td>
</tr>
<tr>
<td>0004</td>
<td>C00C3E92</td>
<td>Yes</td>
<td>VDMAD (01) +17BA</td>
</tr>
<tr>
<td>0005</td>
<td>C00C3F0E</td>
<td>Yes</td>
<td>VDMAD (01) +1836</td>
</tr>
<tr>
<td>0006</td>
<td>C00C3E92</td>
<td>Yes</td>
<td>VDMAD (01) +17BA</td>
</tr>
<tr>
<td>0007</td>
<td>C00C3F0E</td>
<td>Yes</td>
<td>VDMAD (01) +1836</td>
</tr>
<tr>
<td>0008</td>
<td>C00C3C55</td>
<td>Yes</td>
<td>VDMAD (01) +157D</td>
</tr>
<tr>
<td>0009</td>
<td>C00C3D98</td>
<td>Yes</td>
<td>VDMAD (01) +16C0</td>
</tr>
</tbody>
</table>

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

List all types in the current context or list all type information for the type-name specified.

Syntax

TYPES [type-name]

type-name List all type information for the type-name specified.

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 a partial listing of all the types in the current context:

```
: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 the 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
Unassemble instructions.

**Syntax**

**For Windows 3.1**

```
U [address] | [symbol-name]
```

**For Windows 95 and Windows NT**

```
U [address [l length]] | [symbol-name]
```

- `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. In the Command window either eight lines display, 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, it displays using the reverse video attribute. If the current CS:EIP instruction is a relative jump, it contains either the string `JUMP` or `NO JUMP`, indicating whether or not the jump will be taken, and if so, an arrow indicating if the jump will go up or down in the Code window. If the current CS:EIP instruction references a memory location, the contents of the memory location display in the Register window beneath the flags field. If the Register window is not visible, this value displays on 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 95 and Windows NT

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

To unassemble instructions beginning at 10 hexadecimal bytes before the current address, use the command:

```
U eip - 10
```

To display source in the Code window starting at line number 121, use the command:

```
U .121
```

For Windows 95 and Windows NT

To disassemble 100 h bytes starting at MyProc to the Command window, use the command:

```
U myproc L100
```
VCALL

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, all routines that start with the specified characters are listed.

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:

<table>
<thead>
<tr>
<th>CONFIGMG</th>
<th>IOS</th>
<th>VCD</th>
<th>VMCPD</th>
<th>VSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOSMGR</td>
<td>NDIS</td>
<td>VCOMM</td>
<td>VMD</td>
<td>VTD</td>
</tr>
<tr>
<td>DOSNET</td>
<td>PAGEFILE</td>
<td>VCOND</td>
<td>VMM</td>
<td>VWIN32</td>
</tr>
<tr>
<td>EBIOS</td>
<td>PAGESWAP</td>
<td>VDD</td>
<td>VM POLL</td>
<td>VXDLDR</td>
</tr>
<tr>
<td>ENABLE</td>
<td>SHELL</td>
<td>VDMAD</td>
<td>VNETBIOS</td>
<td></td>
</tr>
<tr>
<td>IFSMGR</td>
<td>V86MMGR</td>
<td>VFBACKUP</td>
<td>VPIDC</td>
<td></td>
</tr>
<tr>
<td>INT13</td>
<td>VCACHE</td>
<td>VKD</td>
<td>VREDIR</td>
<td></td>
</tr>
</tbody>
</table>
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

Display the SoftICE version number.

Syntax

VER

*Hint:* 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

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, where 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 where a virtual machine's registers are being saved to the control block, the CS:IP register may be the only valid register (the others have not 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) pertain 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 95. 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 find the address of the last instruction it executed with the VM command (the CS:EIP shown for the VM's V86 thread).
Another more esoteric, but highly valuable use for the VM command is found when Windows faults all the way back to DOS. There are times when Windows cannot handle a fault and exits Windows and you end up back at the DOS prompt.

If this happens, duplicate the problem with I1HERE ON in SoftICE (Windows executes an INT 1 prior to returning to DOS). When the fault happens, SoftICE pops up. Use the VM command to find out the last address of execution and use 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, the following information displays:

<table>
<thead>
<tr>
<th>VM Handle</th>
<th>VM handle is actually a flat offset of the data structure that holds information about the VM.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>This is a bit mask that shows current state information for the VxD. The values are as follows:</td>
</tr>
<tr>
<td></td>
<td>0001H Exclusive mode</td>
</tr>
<tr>
<td></td>
<td>0002H Runs in background</td>
</tr>
<tr>
<td></td>
<td>0004H In process of creating</td>
</tr>
<tr>
<td></td>
<td>0008H Suspended</td>
</tr>
<tr>
<td></td>
<td>0010H Partially destroyed</td>
</tr>
<tr>
<td></td>
<td>0020H Executing protected mode code</td>
</tr>
<tr>
<td></td>
<td>0040H Executing protected mode app</td>
</tr>
<tr>
<td></td>
<td>0080H Executing 32-bit protected app</td>
</tr>
<tr>
<td></td>
<td>0100H Executing call from VxD</td>
</tr>
<tr>
<td></td>
<td>0200H High priority background</td>
</tr>
<tr>
<td></td>
<td>0400H Blocked on semaphore</td>
</tr>
<tr>
<td></td>
<td>0800H Woke up after blocked</td>
</tr>
<tr>
<td></td>
<td>1000H Part of V86 App is pageable</td>
</tr>
<tr>
<td></td>
<td>2000H Rest of V86 is locked</td>
</tr>
<tr>
<td></td>
<td>4000H Scheduled by time-slices</td>
</tr>
<tr>
<td></td>
<td>8000H Idle, has released time slice</td>
</tr>
</tbody>
</table>

High Address | Alternate address space for VM. This is where a VxD typically accesses VM memory (instead of 0). |

Note: It is likely for parts of the VM to be paged out at any one time.
that you pop up SoftICE.

**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

**VM**

Sample output follows:

<table>
<thead>
<tr>
<th>VM Handle</th>
<th>Status</th>
<th>High Addr</th>
<th>VM-ID</th>
<th>Client Regs</th>
</tr>
</thead>
<tbody>
<tr>
<td>806A1000</td>
<td>00004000</td>
<td>81800000</td>
<td>3</td>
<td>806A8F94</td>
</tr>
<tr>
<td>8061A000</td>
<td>00000008</td>
<td>81400000</td>
<td>2</td>
<td>80515F94</td>
</tr>
<tr>
<td>80461000</td>
<td>00007060</td>
<td>81000000</td>
<td>1</td>
<td>80013390</td>
</tr>
</tbody>
</table>
VXD

Display the Windows VxD map.

Syntax

\[ \text{VXD} \ [\text{VxD-name} \mid \text{partial-VxD-name}] \]

VxD-name \hspace{1cm} \text{Name of a virtual device driver.}

partial-VxD-name \hspace{1cm} \text{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.

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.

If a partial name is specified, SoftICE displays information on all VxDs whose name begins with the partial name.

Output

If no parameters are specified, each entry in the VxD map contains the following information:

- \text{VxD name} \hspace{1cm} \text{Name specified in the .DEF file when the VxD was built.}
- \text{address} \hspace{1cm} \text{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.)}
- \text{size} \hspace{1cm} \text{Length of the VxD section. This includes both the code and the data of the VxD group.}
- \text{code selector} \hspace{1cm} \text{Flat code selector.}
- \text{data selector} \hspace{1cm} \text{Flat data selector.}
- \text{type} \hspace{1cm} \text{Section number from the .386 file.}
- \text{id} \hspace{1cm} \text{VxD ID number. The VxD ID numbers are used to obtain the Protected Mode and V86 API addresses that applications call.}
- \text{DDB} \hspace{1cm} \text{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**

This example displays the VxD map in the Command window. The first few lines of the display would look something like the following. The VxD names in the previous table can be used as symbol names. The address of seg 1 will be used when a VxD name is used in an expression.

```
:VXD

<table>
<thead>
<tr>
<th>VxDName</th>
<th>Address</th>
<th>Length</th>
<th>Code</th>
<th>Data</th>
<th>Type</th>
<th>ID</th>
<th>DDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMM</td>
<td>80001000</td>
<td>00193D0</td>
<td>0028</td>
<td>0030</td>
<td>LGRP</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>VMM</td>
<td>80200000</td>
<td>0002F1C</td>
<td>0028</td>
<td>0030</td>
<td>IGRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LoadHi</td>
<td>80001000</td>
<td>00078E8</td>
<td>0028</td>
<td>0030</td>
<td>LGRP</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>LoadHi</td>
<td>80202F1C</td>
<td>0000788</td>
<td>0028</td>
<td>0030</td>
<td>IGRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WINICE</td>
<td>8001ABB8</td>
<td>0027875</td>
<td>0028</td>
<td>0030</td>
<td>LGRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CV1</td>
<td>80042430</td>
<td>0000036B</td>
<td>0028</td>
<td>0030</td>
<td>LGRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDDVGA</td>
<td>8004D27C</td>
<td>00007AD8</td>
<td>0028</td>
<td>0030</td>
<td>LGRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDDVGA</td>
<td>802036A8</td>
<td>000005EC</td>
<td>0028</td>
<td>0030</td>
<td>IGRP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**See Also**

For Windows 95, refer to **VXD** on page 218.
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.

*For Windows 3.1, refer to VXD on page 216.*

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.
SoftICE Commands

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

This example displays the VxD map in the Command window. The first few lines of the display look similar to the following. The VxD names in the previous table can be used 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 C001000 000FDC0 0001 0001 C000E990 C00024F8 Y Y 402 41
VMM C020000 000897 0002
VMM C03E0000 000723 0003
VMM C0320000 00ED50 0005
VMM C0360000 00ED50 0005
VMM C0260000 007938 0006

See Also

For Windows 3.1, refer to VXD on page 216.
**WATCH**

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**

This example creates an entry in the Watch window for the variable hInstance.

```
WATCH hInstance
```

This 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 `lpzCmdLine`. The results show the value of the pointer (0x8158D72E) and the ASCII string (currently null).

```
WATCH lpzCmdLine +char * =0x8158D72E ""
```

Double-clicking on this line expands it to show the actual string contents.

```
lpzCmdLine -char * =0x8158D72E
    char = 0x0
```

**See Also**

Alt-W, WW
**WC**

Windows 3.1, Windows 95, Windows 98, Windows NT

Window Control

**WC**

Alt-F3

Toggles the Code window open or closed; and sets the size of the Code window.

**Syntax**

\[
\text{WC [window-size]}
\]

\[
\begin{align*}
\text{window-size} & \quad \text{Decimal number.}
\end{align*}
\]

**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.

\[
\text{WC 12}
\]
**WD**

_Toggles the Data window open or closed; and sets the size of the Data window._

**Syntax**

```
WD [window-size]
```

_window-size_  
Decimal number.

**Use**

If you do not specify the window-size, WD toggles the Data window open or closed. If the Data window is closed, WD opens it; and if it is open, WD closes it.

If you specify the window-size, the Data window is resized. If it is closed, WD opens it to the specified size.

When the Data window is closed, the extra screen lines are added to the Command window. When the 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 the Data window is closed, the following example displays the window and sets it to one line. If the Data window is open, the example sets it to one line.

```
WD 1
```
**WF**

**Windows 95, Windows 98, Windows NT**  
*Window Control*

Display the floating point stack in either floating point or MMX format.

**Syntax**

```
WF [-d] [b | w | d | f | *]
```

- `-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.

- `*`  
  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**

```
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


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:

Word format: bits(63-48) bits(47-32) bits(31-16) bits(15-0)
Determine if a name or expression is a “known” type.

Syntax

```
WHAT [name | expression]
```

- **name**: Any symbolic name that cannot evaluate 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-type 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-type parameter is something that would not generally be considered a name-type. 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 since 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.

Because 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'
WL

Windows 95, Windows 98, Windows NT

Window Control Command

Toggles the Locals window open or closed; and sets the size of the Locals window.

Syntax

WL [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 Locals 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.

Hint: 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. Note that expandable items are delineated with a plus (+) mark.

Example

If the Locals window is closed, the following example displays the window and sets it to four lines. If the Locals window is open, the example sets it to four lines.

WL 4

See Also

LOCALS, TYPES
**WMSG**

Display the names and message numbers of Windows messages.

**Syntax**

For Windows 3.1

WMSG [partial-name]

For Windows 95 and Windows NT

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**

This 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.

**Example**

This command displays the names and message numbers of all Windows messages that start with "WM_GET".

WMSG wm_get*

A sample output for this command follows:

000D WM_GETTEXT
000E WM_GETTEXTLENGTH
0024 WM_GETMINMAXINFO
0031 WM_GETFONT
0087 WM_GETDLGCODE

WMSG 111

0111 WM_Command
SoftICE Commands

WR

Windows 3.1, Windows 95, Windows 98, Windows NT

Window Control

F2

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 95 and Windows NT

The WR command also toggles the visibility of the floating point Register window if one is open.
**WW**

Toggles the Watch window open or closed; and sets the size of the Watch window.

**Syntax**

```plaintext
WW [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; and 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 four lines. If the Watch window is open, the example sets it to four lines.

```plaintext
WW 4
```

**See Also**

Alt-W, WATCH
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.
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 where that 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, each active handler for that exception frame is listed. For each active handler, its type (try/except or try/finally), the address of its exception filter (for try/except only), and the address of the exception handler display. Because exception handlers can be nested, more than one entry may be listed for each ExceptionRegistration record.

The XFRAME command uses bare addresses in its output. You can use either the STACK or WHAT commands to get an idea of which APIs installed which exception handlers.
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, the following information displays:

- **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 for the currently active thread:

```
:XFRAME

<table>
<thead>
<tr>
<th>xFrame</th>
<th>xHandler</th>
<th>xTable</th>
<th>xScope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x45FFFDC</td>
<td>0x60639638</td>
<td>0x606018B8</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>try/except (0000) filter=0x60606F72, handler=0x60606F85</td>
<td></td>
</tr>
<tr>
<td>0x45FFFA8</td>
<td>0x5FE16890</td>
<td>0x5FE12110</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>try/except (0000) filter=0x5FE125EB, handler=0x5FE125F8</td>
<td></td>
</tr>
<tr>
<td>0x45FFB74</td>
<td>0x77F8B1BC</td>
<td>0x77F61370</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>try/except (0000) filter=0x77F7DD21, handler=0x77F7DD31</td>
<td></td>
</tr>
</tbody>
</table>
```
XG

Go to an address in trace simulation mode.

Syntax

XG [r] address

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

This example makes the instruction at address CS:2FF000h the current instruction in the back trace history buffer.

XG 2ff000
**XP**

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**

This example does a program step over the current instruction in the back trace history buffer.

`XP`
XRSET

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

This example clears the back trace history buffer.

XRSET
**XT**

*Ctrl-F8, XT R Alt-F8*

Single step in trace simulation mode.

**Syntax**

\[ \text{XT [R]} \]

**Use**

Use the XT command to single step the current instruction in the back trace history buffer. The XT command is valid only within the 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**

This example single steps one instruction forward in the back trace history buffer.

\[ \text{XT} \]
**ZAP**

*Windows 3.1, Windows 95, Windows 98, Windows NT*  
*Mode Control Command*

Replace an embedded interrupt 1 or 3 with a NOP.

**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 one before the current CS:EIP.

**Example**

The embedded interrupt 1 or interrupt 3 will be replaced with NOP instructions in the following example:

`ZAP`