

## CHAPTER 8

### Expanded Memory Support

- 8.1 Introduction
- 8.2 Configuring the EMM Environment
  - 8.2.1 Default EMM Pages
  - 8.2.2 Customizing the EMM Page Map
    - 8.2.2.1 Including and Excluding Areas from EMM
- 8.3 Other EMM Features
  - 8.3.1 Increasing Conventional Memory
  - 8.3.2 Automatic Page Frame Locating
- 8.4 EMM Debugging

189

### 8.1 Introduction

Soft-ICE has an expanded memory manager built into its kernel. The Soft-ICE expanded memory manager supports the Lotus-Intel-Microsoft 4.0 specification. This Soft-ICE feature is useful if you are using programs that support the EMM specification, or if you must backfill your conventional memory to extend your conventional memory to 640K or more.

Other 386 control programs that provide EMM capability (such as QEMM or 386-to-the-MAX) will not co-exist with Soft-ICE. If you are using those programs for EMM capability or backfilling, you can use the Soft-ICE EMM manager in their place.

Enabling EMM capability in Soft-ICE involves the following steps:

1. Configure the expanded memory environment with the utility EMMSETUP.EXE. This utility modifies S-ICE.EXE with the desired EMM page map.
2. Add the /EMM switch to your S-ICE.EXE line CONFIG.SYS. This reserves a portion of extended memory for expanded memory. An example line in CONFIG.SYS that reserves memory for EMM is:  
`DEVICE = S-ICE.EXE /EMM 2048`  
This will reserve 2 megabytes of extended memory for EMM use. See section 6.3 (Loading Soft-ICE as a Loadable Device Driver) for details of installing Soft-ICE in CONFIG.SYS.
3. Reboot your system.

190

### 8.2 Configuring The EMM Environment

Before installing S-ICE.EXE with the /EMM switch in CONFIG.SYS file, you may have to run EMMSETUP.EXE to configure the EMM 4.0 environment. This configuration process allows you to select which portions of memory you would like to make available as EMM 4.0 pages. Running EMMSETUP.EXE is highly recommended if you are using programs that take full advantage of the EMM 4.0 specification.

### 8.2.1 Default EMM Pages

By default, S-ICE.EXE with the /EMM switch is pre-configured to allow EMM 4.0 pages in the following areas:

- \* The lower 640K (except for the 1st 64K)
- \* 64K starting at DDH

You may want to reconfigure for the following reasons:

- \* You may have a device such as a network that i the D000H area of memory.
- \* You may want to fill more holes above 640K with EMM pages. This will increase performance and usability of programs like Microsoft Windows. To get maximum performance from Microsoft Windows you should fill every available page with expanded memory.

### 8.2.2 Customizing the EMM Page Map

To configure the EMM map you must use the utility EMMSETUP.EXE. EMMSETUP.EXE allows the page map to be altered, then modifies S-ICE.EXE with the changes.

191

EMMSETUP makes its best guess on automatically configuring the EMM map. EMMSETUP will try to fill much of the address space as possible with mappable pages while working around video cards and ROMS. If its guess is not good enough or not to your liking you can override it. Overriding may be necessary if you have a network, a special video adapter or a memory-mapped option adapter.

To configure the EMM map enter:

```
EMMSETUP
```

EMMSETUP displays a matrix of 16K memory pages available in the lower 1 megabyte region. The matrix is divided into 16 columns each representing 64K (from 0 to 10000H). There are 4 rows representing the four 16K pages in each 64K region.

Each block of the matrix can contain an E, X, R or V. Blocks that contain an E are available as EMM pages; blocks that contain an X are not. Blocks that contain an R are memory areas that have been

identified by EMMSETUP as ROM areas. You can override these areas with an E if desired, however, this should only be done if the ROM is never accessed. Blocks that contain V are identified as video memory. We have made worst case assumptions on video memory. Your particular video card may not take up as much as we have 'guessed'. You can override the memory blocks that contain unnecessary V's if desired.

If you are satisfied with EMMSETUP's guesses, press the F10 key and S-ICE.EXE will be modified with these parameters. You must reboot before any changes made to S-ICE.EXE will take effect. If you wish to override EMMSETUP's guesses, do so at this time.

192

#### 8.2.2.1 Including and Excluding Areas from EMM

To include an area as EMM 4.0 memory simply guide the cursor to the desired block, then type E. Conversely, to exclude an area from EMM 4.0 memory, guide the cursor to the block and type X. When you are satisfied with your changes, press F10 to exit the program. All changes are automatically stored in the S-ICE.EXE file. If you wish to exit without modifying S-ICE.EXE press ESC. You must reboot before any changes made to S-ICE.EXE will take effect.

When including upper memory blocks keep in mind the following:

- \* CGA occupies from B800H to C000H.
- \* MDA occupies from B000H to B100H.
- \* Most Hercules cards occupy from B000 to C000H.
- \* EGA occupies from A000H to C000H and from C000H to C400H.
- \* VGA (mother board) occupies from A000H to C000H.
- \* VGA (option card) occupies from A000H to C000H and C000H to C800H.
- \* PS/2 System ROM occupies from E000H to 10000H.
- \* PS/2 ESDI ROM occupies from CC00H to D000H
- \* Most AT Compatible Roms occupy from F000H to 10000H.
- \* Compaq systems, Micronix motherboard systems, and most Chips and Technologies motherboard systems move the EGA/VGA ROM to E000H However they still occupy the C000H region as well.
- \* Token Ring Networks usually occupy from CC00H to E000H.
- \* Many Networks occupy memory regions in the D000H area.

The above guidelines are for 'generic' devices, Many implementations by different computer vendors and

adapter card vendors will vary.

### 8.3 Other EMM Features

S-ICE.EXE with the /EMM switch has two features that are automatically enabled depending on your system configuration. These features are backfilling and relocating the page frame.

#### 8.3.1 Increasing Conventional Memory

System memory will automatically be backfilled up to the first non-mappable page. This means it starts looking at contiguous E's at location 1000, and continues until it finds the first non-contiguous E. If the contiguous E's go beyond the amount of your system's base memory, memory will be backfilled up to the first R, V, or X that is found.

The benefit of backfilling is that you can increase the amount of usable system memory to greater than 640K. The backfilled memory is available within DOS. If you do not want memory backfilled, use EMMSETUP to make page non-mappable (X) at the point you wish system memory to end.

#### Note:

Monochrome-only systems (MDA) can backfill up to B000H to add an additional 64K to conventional memory. CGA systems can be backfilled up to B800, adding an additional 96K to conventional memory. EGA and VGA systems can be backfilled only if no graphics programs will be run. You can backfill an EGA or a VGA system up to B800:0 if no graphics programs will be run.

#### Warning:

If memory is backfilled, DO NOT UNLOAD Soft-ICE. Doing so will cause your system to crash.

#### 8.3.2 Automatic Page Frame Locating

Most EMM-knowledgeable programs require a 64K page frame that is not used as normal DOS memory. This is normally located above the video device area. However in some systems there is no 64K contiguous region to place the page frame. In these instances S-ICE.EXE 'steals' top 4 mappable pages of lower memory. The net result that lower DOS memory shrinks by 64K.

### 8.4 EMM Debugging

A range break point or a break point on memory that is in an EMM mappable area will stay at that address no matter which EMM page is mapped in.

When debugging EMM programs, the EMMMAP command may also be very useful. See section 5.6

for more information.

The D, E, S, F, and C commands can be used to view or modify any allocated EMM handle page. The page does not have to be currently mapped in. The syntax of these commands is similar to that of the commands when being used for non-EMM pages, except for the following:

- \* In the D, E, S, and F commands, the address portion of the command must be specified in the following way:  
Hhandle# Ppage# offset  
where handle is a number specifying which EMM handle to use, page is a number specifying which EMM page to use, and offset is a number from 0 to 4000H, specifying the offset from the beginning of the page.

195

Example:

```
DB H1 P3 0
```

This command will dump bytes from page 3 of handle 1, starting at offset 0.

- \* The C command must be specified in the following way:

```
C Hhandle# Ppage# offset1 Llength offset2
```

where handle and page are the same as above. offset1 is a number from 0 to 4000H, specifying the offset from the beginning of the page, where the first data block to be compared is located. offset2 is a number from 0 to 4000H, specifying the offset from the beginning of the page, where the second data block to be compared is located.

Example:

```
C H2 P4 00 L10 1000
```

This command will compare the first 10 bytes of memory located at offset 0 of page 4 of handle 2 with the first 10 bytes of memory located at offset 1000 of page 4 of handle 2.

Note:

Subsequent uses of the D, E, S, F, and C commands will continue to use the handle and page last specified. To get back to conventional memory, use one of the above commands with a segment specified in the address field, for example:

D 0:0

196