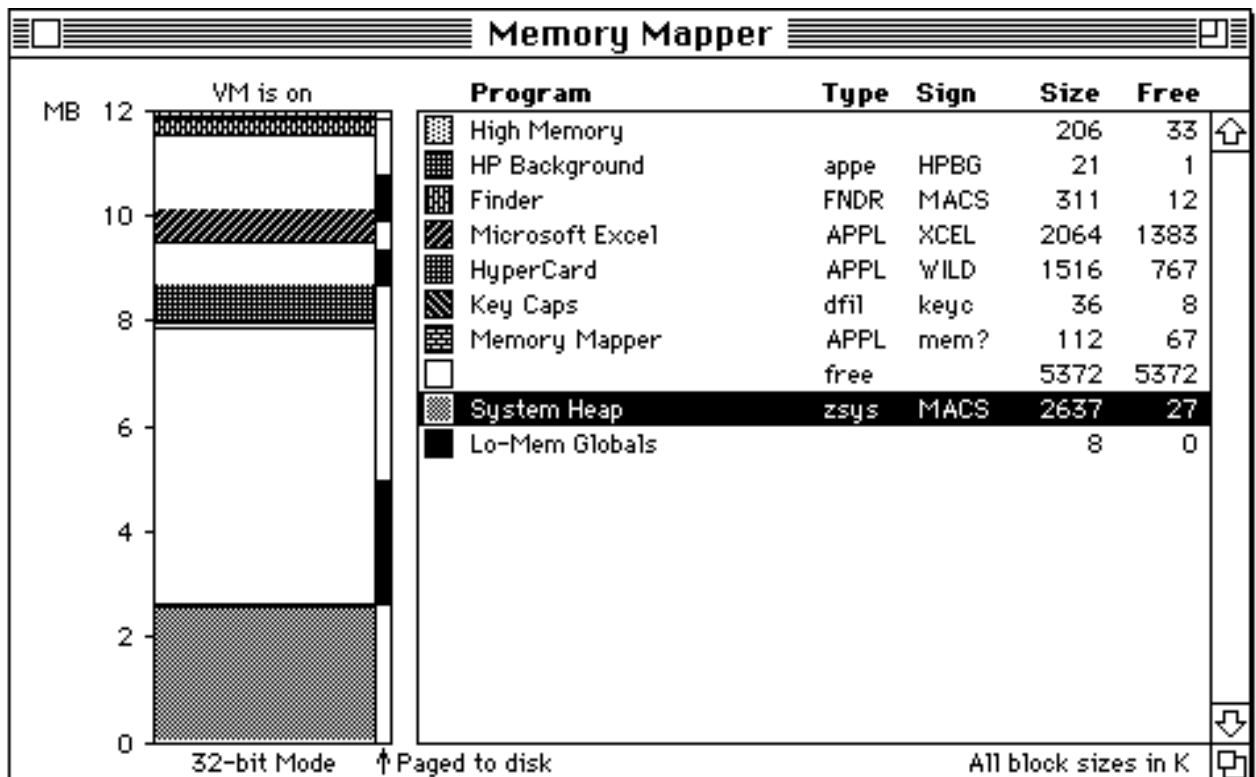# Memory Mapper 1.1

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What Is a Memory Map?

If you've done any programming on the Mac you've probably seen drawings of the Macintosh's memory map. The memory map is a grid which graphically shows the location of various system structures in RAM and where they are in relation to each other.

Well, just to make all that theory seem more real, Memory Mapper will draw that map for you so you can see exactly what is living in your Mac's RAM right now:

A Typical Screen

How Does It Work?

Memory Mapper does it's magic by looking at low-memory globals, querying the Process Manager, and checking the page state of each piece of memory (if virtual memory is on). Consequently, Memory Mapper *requires* System 7.

Item List

The Item List shows the partition's name, type, signature, total partition size, and the amount free space left in that partition (both sizes in kilobytes).

The **name** is obviously the application's name or the name of the system structure. Unused areas of RAM which are larger than 2K (there's always a few bytes between programs) are also indicated.
The **type** is the four-character type code: APPL for applications, appe and INIT for faceless background processes (they don't show up in the Application menu), dfil for desk accessories, etc. 'free' indicates unused sections of memory.
The **signature** is the unique four-character code which identifies the process so that it can be matched to the documents and icons which are associated with it.
The **size** is the total size of the partition that has been assigned to it. You'll notice that it is larger than the amount reported by the Finder's Get Info dialog or the application's SIZE resource. This is because the memory manager adds 16K for stack space when launching programs on Mac IIs or 8K when launching on Mac Pluses.
The **free** space is what the Process Manager reports as the unused and available heap space for the process. In the case of the system heap, it is the amount reported by FreeMemSys.

Memory Map

The memory map shows the entire physical RAM of your computer if virtual memory is not on, or the total logical RAM if it is. The map is drawn to scale and shows the way the memory space is partitioned for use by the System and applications.
For the system heap and the applications the amount of the partition that is in use is indicated by filling in the lower part of the partition with a pattern. This is proper because the heap tends to fill up from bottom (low memory addresses). In reality, it is not at all accurate because heap zones may be fragmented into many objects with random amounts of space between them. To really see what is inside a heap zone I recommend Joe Holt's Swatch program which does a very nice job.

Virtual Memory

If you are using virtual memory you will see another area to the right of the memory map which indicates which parts of memory are in RAM and which are paged out to disk. The black areas are what are currently stored in the backing file on the hard disk. In the screen dump above, the backing file is 12 megabytes in size, augmenting the 8 megabytes of physical memory with 4 megabytes of virtual memory.

Process Info Selections

If you click on one the items in the Item List the area corresponding to that item in the map will be highlighted. If you double-click on an item you will get a small dialog which provides a little more information about that memory partition:

```
┌─────────────────────────────────────────┐
│                                         │
│   ◇    Process:  TeachText              │
│        Address:  $007294F8              │
│        PSN:      $0000/$2005            │
│                                         │
│              ╭─────────────╮            │
│              │     OK      │            │
│              ╰─────────────╯            │
│                                         │
└─────────────────────────────────────────┘
```

The Address is the base address of the process or partition. PSN indicates the process serial number: high/low.

Automatic Updates

As you open and close applications they naturally need to be removed from or added to the Item List. Also, as you use applications, the Memory Manager may page their memory into RAM if it chooses and page other memory out to disk. In order to see these changes in the map, choose Update from the file menu and the entire window will be rebuilt.

If you would like to have updates to the map occur automatically, select the Update Regularly item to activate a 10 second update interval. Memory Mapper will run in the background while you are launching and closing applications so can see what is happening to memory and where applications are being placed. You can get a real perspective from this on such system messages as "Not enough memory to load application" and "Insufficient memory for this operation" (often seen when an application is sitting against the system heap and preventing it from growing).

Miscellaneous Notes and Oddities

Finder 7.0 reports a size for "System Software" which is larger than

the system heap. Apparently this number is some combination of the system heap, high and low memory, and the Finder's partition. However when I add all those items up I get a larger number than what the Finder reports so I'm mystified as to how the Finder is doing it's calculation.

On Macs which use main memory for internal video, the video buffer is located in the High Memory area. I would have liked to have shown the video buffer in my map but its location is fairly hardware specific. For instance on my Mac IIci, the video buffer's address (ScrnBase) is at $FB080000. That is in the hardware space assigned to slot $B. Unfortunately, IIci's only have three slots, $C, $D, and $E so slot $B is imaginary. If I could call GetPhysical to find out where the video really is, I would find that it is somewhere below $04400000 which is in Bank B of my RAM SIMM slots. (There is a huge difference between the addresses of Bank A and B which is transparent to applications because they only see memory through the 68030's MMU.) Obviously, every Mac has it's own complexities similar to this one so I have left display of video buffers out. Just note that if you are using main memory (not VRAM) for internal video the high memory area will be correspondingly larger.

Speaking of high memory, I include in this area everything above the highest-addressed process. Actually, there is a small gap between BufPtr and the end of the highest process (usually the Finder or a process created by an INIT). I don't know what is in this area, but nothing else ever gets loaded into it even if it is small enough to fit. So, since it's not quite free, I put its size into High Mem's free area instead of treating it as a separate block of memory.

Sometimes the Info Dialog will display "Missing Icon" instead of the process's icon. There can be several reasons for this. Except for system icons, I am pulling the icon from the desktop database of the

volume that the process (program) was launched from. If the icon isn't in the desktop database, due to improper bundle resources for example, I won't be able to get it. Also, volumes under two megabytes in size, such as floppy disks, don't have desktop databases. If for any reason I can't get the icon, I use the Missing Icon instead.

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