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Macintosh LC II: Virtual Memory

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TOPIC ---

The Macintosh LC II supports a demand paged virtual memory environment -- a
distinct advantage over its predecessor, the Macintosh LC. The 68030
microprocessor comes equipped with the MC68851 PMMU (page memory management
unit).

DISCUSSION --

Addressing Scheme

The Macintosh LC II can generate either 24-bit or 32-bit virtual addresses.

The 24-bit mode allows a total of 11MB virtual memory. In 24-bit mode the
total addressing space is 16MB. In this address space, 2MB is reserved for
ROM, 1MB for I/O, 1MB for video, and 1MB is just reserved for a total of
5MB used in this 16MB space. The PDS slot also takes up 1MB. So when a
card isn't installed, virtual memory can use this space. With a PDS card
present, 10MB of virtual memory is available.

In 32-bit mode, because the ROM is 32-bit clean (that is, the ROM code has
the ability to use the full 32 bits of address space), the total addressing
space is 232, or 4 gigabytes. Of this 4 gigabytes, 3 gigabytes is used for
ROM, I/O, slot space, and expansion, leaving a maximum of 1 gigabyte for
virtual memory.

Virtual Memory

With the Macintosh LC II, limited RAM expandability and the cost of RAM
SIMMs makes virtual memory an attractive option. Virtual addressing allows
the Macintosh LC II to address data on a disk drive as if it were in main

memory. That means that you can launch more applications and data on the
Macintosh LC II than the amount of installed RAM can contain.

The 68030 and its PMMU provide the hardware support for virtual memory.
PMMU performs memory paging, a technique where a needed page of memory is
transferred (swapped) into main memory from the disk. In addition, the
PMMU swaps out of main memory, a page that isn't currently needed. The
PMMU keeps track of 64 pages in memory.

With 32-bit addressing on and enough space available to allocate on hard
disk, you can create a very large virtual memory address space. However,
it's best for performance reasons to limit the size of your virtual memory
to twice the size of installed RAM. By limiting the size of your virtual
memory, you'll help eliminate excessive paging activity known as thrashing.

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