NOTE: This Technical Note has been retired. Please see the Technical Notes page for current documentation.

Technical Note HW515
Memory Hardware Q&As

This Technical Note contains a collection of archived Q&As relating to a specific topic--questions sent the Developer Support Center (DSC) along with answers from the DSC engineers. Current Q&A's can be found on the Macintosh Technical Q&A's web site.

[Oct 01 1990]

Macintosh 72-pin SIMM modules

Date Written: 3/2/93

Last reviewed: 3/18/93

The documentation that I have is incomplete as far the upper address lines for the Macintosh 72-pin SIMM x32 modules. Is A10 connected to pin 19 and A11 connected to pin 29? Also, can I use either Fast Page Mode or Static Column on SIMMs for the new 72-Pin compatible Macintosh models? Can Macintosh 16 MB or 32 MB 72-pin SIMM modules use 4K 4Mx4 refresh DRAM?

Yes, A10 is connected to pin 19 and A11 is connected to pin 29. Although none of Apple's current models can make use of SIMMs this large, future machines will, and the connection of these address lines won't make SIMMs incompatible with current machines.

Fast Page Mode is required of 72-pin SIMMs used in Apple products. You can't use Static Column on SIMMs that will be used in Apple Products.

All 72-pin compatible Macintosh models support 2K refresh parts. Not all models can or will support 4K refresh parts. We can't at this time give you a list of which models may support 4K refresh.

PowerBook Duo 16MB memory DRAM

Date Written: 1/14/93

Last reviewed: 4/1/93

Which 16 MB (2M x 8) DRAM is specified for the PowerBook Duo--the 2K refresh (11-row, 10-column addresses) or 4K refresh (12-row, 9-column addresses)?

The PowerBook Duo supports both 11-row/10-column address *and* 12-row/9-column address RAMs. However, you must use RAM that's compatible with the memory controller's refresh rate, which is 1024 refreshes in 128 ms.

Use Centris SIMMs that follow Apple design guidelines

Date Written: 12/2/92

Last reviewed: 3/1/93

We were told that "industry-standard 72-pin SIMMs" work in the Centris systems, but we've tried 512Kx36, 1Mx36, and 2Mx36 industry-standard 72-pin SIMMs, with no luck. All we got were bad memory chimes. Where can I find a table of pinouts for Centris SIMMs?

The pinouts for Centris SIMMs are listed on pages 25-27 of the Developer Note "Macintosh Centris 610, Macintosh Centris 650, and Macintosh Quadra 800 Computers" on the latest Developer CD. Use only Apple SIMMs or third-party SIMMs that specifically follow Apple's design guidelines for the Macintosh Centris. "IBM-compatible" 72-pin SIMMs weren't tested for the Macintosh Centris; they may or may not work.

256K VRAM but not 512K for Macintosh Quadra SIMMs

Date Written: 2/28/92

Last reviewed: 2/28/92

Does the Macintosh Quadra support either 256K or 512K VRAM SIMMs, like the Macintosh LC does?

A full bank of 256K VRAM in the Quadras supports 8-bit video on the 21" monitors, but the video hardware does not support 512K VRAM.

Macintosh LC and Quadra VRAM speed requirements

Date Written: 2/28/92

Last reviewed: 2/28/92

What speed VRAM is required for the Macintosh LC and Quadra SIMMs?

The VRAM for Macintosh LC and Quadra SIMMs currently is 100 ns.

Macintosh LC and Quadra Block-Write VRAM support

Date Written: 2/28/92

Last reviewed: 2/28/92

Do Macintosh LC and Quadra SIMMs require Block-Write VRAM?

The SIMMs that Apple uses all support Block-Write VRAM, but the system software currently does not require Block-Write VRAM. Whether it will in the future is unknown.

Try zapping PRAM if Macintosh II won't shut down

Date Written: 2/28/92

Last reviewed: 2/28/92

My Macintosh IIsi reboots whenever it's shut down, like the power switch is in the locked position. What could be causing this?

A DTS engineer here ran into this very same problem with his Macintosh II, and was able to rectify the problem by

zapping the Parameter RAM (PRAM). He'd tried reinstalling the system files as well as a new keyboard, but that didn't solve the problem. In order to zap the PRAM, hold down Command-Shift-P-R while starting up your machine.

If zapping the PRAM doesn't do the trick, you might consider taking your machine to a local service provider (Apple authorized, of course) to see if there is a hardware problem/failure with the power switch in the back of the CPU. For more information on service providers, please contact the Apple Assistance Center at (800) 776-2333.

Macintosh LC Developer Note VRAM correction

Date Written: 9/16/91

Last reviewed: 6/14/93

The VRAM memory map information in Table 1-1 on page 10 of the "Macintosh LC Developer Note" is incorrect. The line that currently reads:

```
     Function      24-bit mode        32-bit mode
     VRAM          $FC 0000-$FF FFFF  $50FC 0000-$50FF FFFF
```

should be corrected as follows:

```
     Function      24-bit mode        32-bit mode
     VRAM          $F4 0000-$FB FFFF  $50F4 0000-$50FB FFFF
```

Macintosh RAM addressability under System 7.O

Date Written: 6/10/91

Last reviewed: 10/22/91

```
Maximum
Addressable  Classic              II, IIx   IIci,
RAM in:      Plus, SE   SE/30     IIcx      IIfx     IIsi    LC    Portable
-----------  --------   -----     --------  ------   ------  ----- --------
24-bit mode     4         8          8         8        8     8^    9/8*

24-bit mode    N/A       13**       13**      13**     12^^   N/A   N/A with VM

32-bit mode    N/A       128t       128t      128      65tt   10^   N/A

32-bit mode    N/A       1GB~       1GB~      1GB~     1GB~   N/A   N/A with VM
```

* The maximum addressable RAM on the original Macintosh Portable is 9 MB; because of its memory controller, the backlit Portable is limited to only 8 MB of RAM.

** The original 24-bit mode memory map allocated 8 MB for RAM, 1 MB for ROM, 1 MB for I/O and 6 MB for NuBus(TM) (1 for each of 6 slots; if the slots were not occupied this memory could be used for RAM) for a total of 16 MB. On the Macintosh SE/30 and IIci, built-in video takes up 1 MB that was previously allocated for an expansion slot. On the Macintosh II, IIx, IIcx and IIfx, a video card is needed which also takes away 1MB. That means there is 16MB -1MB (I/O) - 1MB (ROM) - 1MB (video on board or on NuBus) =13MB maximum RAM memory available. On the Macintosh II, the 68851 PMMU chip is needed for VM.

^ The Macintosh LC uses its own contiguous memory scheme that gives a total of 8 MB accessible RAM in 24-bit mode and

10 MB RAM in 32-bit mode.

^^ The 24-bit memory map on the Macintosh IIsi is the same as for all other Mac II systems. It allocates 8 MB for RAM, 1 MB for ROM, 1 MB for I/O and 6 MB for expansion slots. However, because of the slot table, the on-board video takes up 2 slots rather than 1, which results in 2 MB allocated for on-board video. That means there is 16MB -1MB (I/O) - 1MB (ROM) - 2MB (on-board video) =12 MB maximum RAM available.

t - With either a 32-bit software patch (Connectix Mode32) or A/UXreg.. Also, Macintosh II and IIx systems can be upgraded to Macintosh IIfx systems; likewise, Macintosh IIcx systems can be upgraded to Mac IIci systems.

tt - The Macintosh IIsi has 1 MB soldered on the main logic board (Bank A) and 4 SIMMs (Bank B). A maximum of 64MB is addressable in Bank B, which gives a total of 1+64=65MB RAM.

~ Under the 32-bit memory map, 1 GB is allocated to RAM, 256 MB to ROM, 256 MB to I/O, and 2.5 GB to NuBus. VM in 32-bit mode only accesses the 1 GB RAM. Again, for the Macintosh SE/30, II, IIx and IIcx, it is necessary to have either a 32-bit software patch (Connectix Mode 32) or A/UX. Or, a Macintosh II or IIx can be upgraded to a Macintosh IIfx; likewise, a Macintosh IIcx can be upgraded to a Macintosh IIci. On the Macintosh II it is also necessary to have the 68851 PMMU.

No 1 MB VRAM SIMM for Macintosh LC

Date Written: 3/29/91

Last reviewed: 5/21/91

Will there be a 1 MB VRAM SIMM available for the Macintosh LC? In other words, can we get 24-bit video?

The Macintosh LC video hardware cannot handle 24-bit video. If you put 1 MB VRAM on the board, the upper 512K would be useless.

No 32-bit clean Macintosh II ROM upgrade

Date Written: 1/22/91

Last reviewed: 1/30/91

I have heard that there is a ROM upgrade available for the Macintosh II which is necessary for it to be fully 32-bit clean or to be compatible with System 7.0. Please respond and let us know whether a ROM upgrade is necessary, and if so how it may be obtained, and if there is any cost for the upgrade.

We don't have a 32-bit clean ROM upgrade kit for any of our Macintosh systems. All our newer Macintosh systems have 32-bit clean ROMs, but all our computer models prior to the Macintosh IIci don't. You might be thinking of the PMMU chip upgrade.

This won't stop you from using System 7, however. It just keeps you from using 32-bit addressing. You can still use Virtual Memory if you put a PMMU in your Macintosh II. Even with a PMMU, however, you won't be able to access more than 14 megabytes of RAM (minus 1 megabyte for each NuBus slot you're using). If you did have 32-bit clean ROMs and used 32-bit addressing, you could address up to 128 megabytes of physical RAM, and address over a gigabyte of Virtual Memory! Most people would not need to use even a fraction of that. So even if you did have 32-bit clean ROMs, it's likely you wouldn't need 32-bit addressing.

Macintosh II "32-bit clean" upgrade

Date Written: 11/28/90

Last reviewed: 2/20/91

I want to upgrade my Macintosh II with new ROMs so that I can be 32-bit clean and address more than 14 MB of RAM. Will the SuperDrive upgrade with new ROMs provide the solution I am looking for? If not, then is there any way to be able to address RAM using 32 bits in the future on a Macintosh II or do I have to upgrade to a Macintosh IIfx? I would prefer to

stay with my Macintosh II and would like an upgrade path of this nature.

Currently the only way to obtain 32-bit clean ROMs for a Macintosh II is to purchase the Macintosh IIfx logic board upgrade. There are no plans at this time to provide 32-bit clean ROMs for CPUs prior to the Macintosh IIci that would allow the extended 32-bit addressing supported by System 7.0.

Macintosh IIci DRAM specifications

Date Written: 11/17/89

Last reviewed: 12/17/90

What are the required specifications of the Macintosh IIci DRAM?

Here are the Macintosh IIci memory specifications:

```
256K (made from 1 MB Fast Page Mode parts), 1 MB, 4 MB, or 16 MB SIMMs
RAS:            80 ns
CAS:            20 ns
Access Type:    Fast Page Mode
Refresh Type:   CAS before RAS
Refresh Period: 15.6 us
```

The SIMMs can be composed of the following sizes in each bank:

```
4  256K SIMMs (composed of 1 MB of fast page parts only)
4  1 MB SIMMs
4  4 MB SIMMs
```

If on-board video is going to be used, RAM must be installed in Bank A, since the frame buffer is maintained beginning at physical address $0000 0000. If two different sizes of RAM will be installed--that is, 5 MB comprised of 4 256K and 4 1 MB SIMMs--then install the 256K SIMMs in Bank A for best video performance.

X-Ref:

Macintosh Technical Note "Macintosh Memory Configurations"

Applications should not change Macintosh parameter RAM setting

Date Written: 5/3/89

Last reviewed: 6/14/93

How can I change the Macintosh parameter RAM settings?

Changing parameter RAM is not supported. *Inside Macintosh* documents portions of PRAM and a couple of calls that will modify it. The layout of the standard PRAM was detailed, but since then PRAM has changed and extended. PRAM is reserved for the system, and is set by the user via the control panel. As you may have noticed, changing the settings of PRAM does not necessarily mean the system will start using those settings.

The system examines the contents of PRAM at startup time, and build its low-memory global information based on it. If you change PRAM during run-time, you would also have to change all of the affected low-memory globals. This is exactly how the Mouse and the rest of the control panel items work. Also, there is no trap to change the RAM cache setting because

it is considered a user function. The RAM cache will only go into effect at the next application's launch. The only supported documentation regarding the cache is in the Macintosh Technical Note "Caching" and *Inside Macintosh.*

Parameter RAM is under the control of the user, not the application. We do not condone, and can't support, applications that attempt to modify the PRAM.

X-Refs:

Guide to the Macintosh Family Hardware   (Addison-Wesley)

"The Operating System Utilities," *Inside Macintosh*   Volume II

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