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DEBABLEIZING TECHNO-BABBLE

The Ins and Outs of RAM

RAM is the magic elixir for increasing Mac speed. We install it and forget it, or we never install it and still never think about it. But RAM is an intricate and integral part of your system, making life nicer or making you crazy by making your Mac act wonky. **BY DEBORAH SHADOVITZ**

Printed circuit board (PCB)

This green card is deceptive. It's actually eight very thin boards laminated together in layers, each layer containing finely silk-screened copper traces that act like wires. Many connections exist between the PCB's connector pins and these traces, and then between each layer.

Resistors and Capacitors

These are the tiny bumps mounted around the chips on the PCB's surface. Resistors decrease current passing through them. Capacitors smooth voltage flow.

EEPROM (Electrically Erasable Programmable Read-Only Memory)

Contains short-burst data (SBD), which reads the minute parameters of the module to help it work more efficiently.

Memory Chips

The black stuff you see is "the package," a ceramic protective covering. The internal wiring is typically silicon. Within are memory cells or bits (binary digits), each comprising a paired transistor and capacitor. Today's bits are smaller than a speck of dust. Don't think "manufactured"; think etched or painted onto the board. A 1GB DIMM is made up of over 8 billion bits inside these chips. Each bit is constantly being charged and discharged. When they're 51 percent charged, they're read as ones, and when they're under 50 percent charged, they represent zeros.



Fingers, aka Pins

The connection between the motherboard and the memory card, made of thin layers of gold. Collectively, the fingers are called the bus connector. (On a DIMM, each finger on each side counts as one pin. On a SIMM, both sides counted as just one pin.)

Keying Notch(es)

Used to make sure you don't insert the wrong card or put the right card in backward.

Locking Notches

Each memory slot typically has levers that grab the board in these notches, holding it in place.

RAM Explained

The basis of computing is data storage, manipulation, and retrieval. In-use data is stored in two main places: RAM and your Mac's hard drive.

You install applications on, and save documents to, your Mac's hard drive. When you launch an application, necessary parts of its code read into memory (RAM) so the app can be used. If you don't use an app for a while and there's demand to better use RAM, the resting app moves to an area called *virtual memory* on the main hard drive. The app is returned to RAM if you use it enough to make it a priority. Documents work similarly.

It's faster to locate data on RAM's simple grid than to seek it on a huge hard drive. Thus, the more RAM a machine has, the less time is spent sending signals all the way to the drive, seeking data's location, and sending it back for utilization.

DRAM (Dynamic RAM)

The true name for what we typically just call RAM. It's referred to as "dynamic" because it's constantly being written and rewritten as data changes.

DIMM (Dual In-line Memory Module)

One of the current formats of chips on a board, adapted by Apple in 1995. (It replaced the Single In-line Memory Module, or SIMM.)

SO-DIMM (Small Outline DIMM)

A DIMM but with a smaller card. Used today in all Macs except Mac Pros and Xserves, which use FB-DIMMs (fully buffered DIMMs).

DDR2 SDRAM (Double Data Rate 2 Synchronous Dynamic RAM)

The first part, DDR2, stands for double data rate 2, which means the SDRAM is faster, cooler, and requires less power. This type of SDRAM started appearing in Macs in 2005, and now is used in all Macs.

Dual-Channel Memory Architecture

The system design in today's Macs. Identical DIMMs are paired, then treated as one module. Latency still exists, but you get double the read/write speed per communication, so overall, it's faster than a single-channel memory architecture.

ECC (Error Correcting Code)

Found in the Mac Pro and Intel Xserve, ECC self-corrects small bit errors in RAM.

Cache

Tiny memory module on a Mac's processor. The CPU (not the Mac OS) chooses most-needed instructions and data, holding it for fastest access.

Know When You Need More

More RAM generally provides a faster computing experience—except if you run only one or two undemanding apps concurrently. To find out how much RAM your Mac has, check the System Profiler (Apple Menu > About This Mac > More Info). Also try these methods:

- Check your Activity Monitor app. At the bottom, click System Memory. If the amount of free memory is small, you may want to get some more.
- If your system runs well in any app but you notice a slowdown when switching apps, more RAM can help.

Choosing RAM

Poor-quality RAM won't slow your Mac down—RAM either works or doesn't work—but there's a greater chance of failure. We've had good experiences with these retailers: Crucial (www.crucial.com), Kingston Technology (www.kingston.com), and Other World Computing (www.macsales.com).

Handling RAM

RAM is highly sensitive to static electricity, so avoid touching it as much as possible. Here's how to handle it with care.

- Don't open the package until you're seated at your Mac and ready to install.
- Hold by the board's side and top edges only.
- Don't touch anything on the surface.
- Don't flex the board.

Installing RAM

The basics are always the same.

- Don't work on carpet.
- Shut off the Mac and let it cool.
- Unplug cables, and disconnect the power cord.
- Touch metal inside your Mac to discharge static electricity.
- Hold the board only by sides or top.
- Match the board's notch to the RAM slot's bump.
- Insert as instructed.
- With one finger on each side of the top edge, press into the slot with even pressure. Typically, retainer clips will snap into place.
- Push again to ensure it's sitting firmly, connecting fully.

Upon startup, choose Apple Menu > About This Mac. If the total RAM number is correct, you're good to go.

Deborah Shadvitz was inspired to research RAM after her own Mac's memory went haywire.