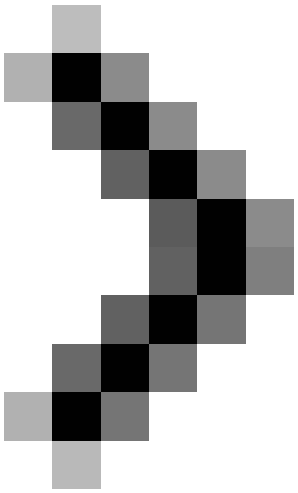
Introduction to Dual Channel (Part 2)

This tutorial will introduce you to some of the issues of Dual channel technology: how it works, how to set it up, and how to calculate transfer speeds, etc.

Gabriel Torres



Introduction to Dual Channel (Part 1)

Let's first get a system that doesn't support dual channel functionality (i.e., a single channel system).

When saying that the memory data bus is 64-bit, that means that those 64 wires (physical wires on the motherboard) will connect the memory controller and memory sockets. These wires are labeled from D0 to D63. Memory data bus is shared for all memory sockets. The address and control buses will activate the correct memory socket based on the address where the data must be saved or read. We will demonstrate this in Figure 2 below.

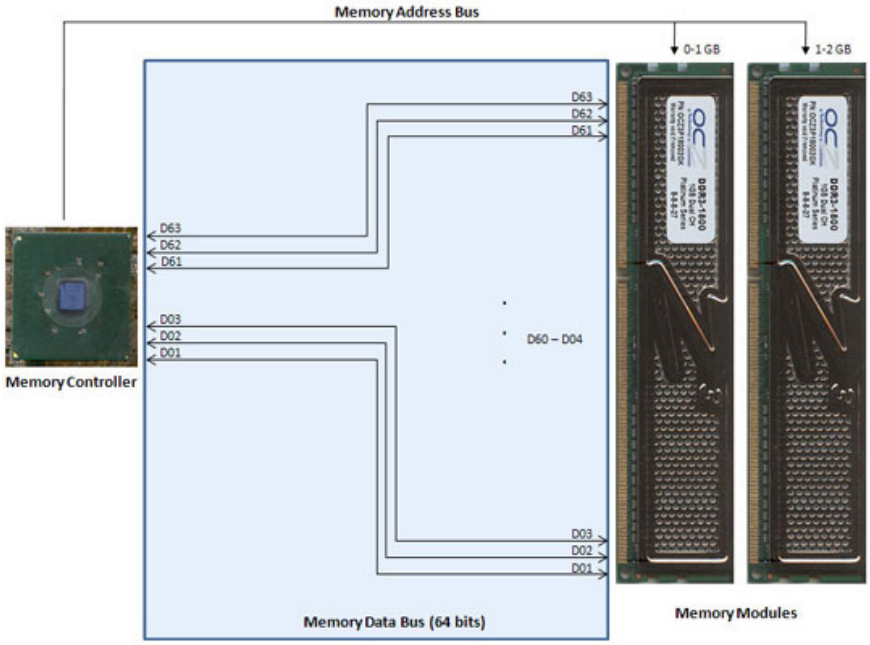


Figure 2: How does single channel work?

On dual-channel support systems, the memory data bus is expanded to 128 bits. This means that on such systems there will be 128 wires connecting the memory controller and the memory sockets. These strings are labeled from D0 to D127. Because each memory module can only accept 64 bits per cycle, there are two memory modules used to fill the 128-bit data bus. So for dual-channel technology to work you need an even number of memory modules on the system (assuming that AMD CPUs and Intel chipsets support this technology). If you only install one module, this technology will not work because the memory will still be accessed 64 bits per cycle. In other words, dual channel works by accessing both modules in parallel at the same time.

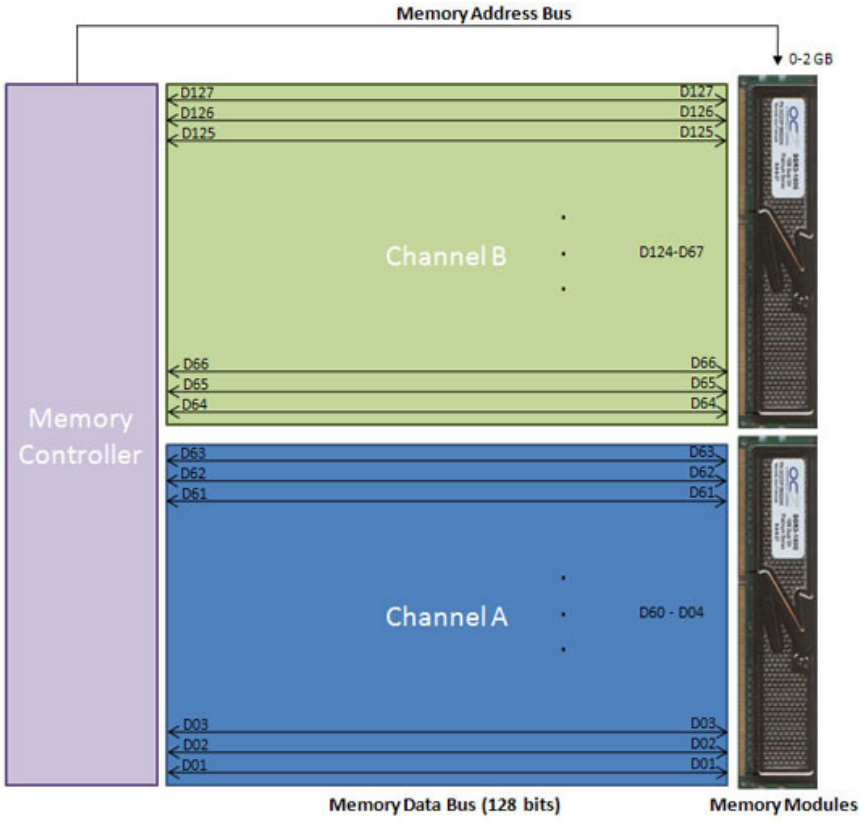


Figure 3: How Dual Channel works

Since the two modules are accessed at the same time, they must be identical (same capacity, same timing and same clock rate).

Activate Dual Channel

To enable dual channel technology, you need to have:

- Chipsets and motherboards (Intel CPU) are compatible or CPU (AMD) compatible.
- Two or four identical memory modules are compatible with the technology supported by the motherboard (DDR-SDRAM, DDR2-SDRAM or DDR3-SDRAM).

AMD CPUs designed on sockets 939, 940, AM2, AM2 + and F (1207) are dual channel compatible (socket 462 motherboards with nForce 2 chipsets are also compatible) . For Intel, you will have to check the motherboard's manual or the specifications page on the manufacturer's website to see if the motherboard is compatible with dual channel technology.

If you have only one memory module, the dual channel will not be available here. So if you want a computer with 2 GB of RAM, the best way to achieve this is to use 2 1GB memory modules instead of a 2GB memory module, because in the first case you can enable dual mode channel (improves system performance), the second case is not possible.

In case if your motherboard has only two memory sockets, to enable dual channel you simply have to install two memory modules.

On motherboards with up to four memory sockets, commonly found in motherboards today, the correct way to enable dual channels is a bit different.

If you have 4 memory modules, simply install all 4 modules and then dual channel will be activated.

If there are only two memory modules - in such a good case - you have to pay attention to some issues. (For convenience of explanation, let's number the motherboard sockets of 1, 2, 3 and 4).

Motherboards for Intel CPUs

On motherboards for Intel microprocessors, dual channels are typically enabled by skipping a memory socket. Therefore you must install the first memory module in socket 1 and the second memory module in socket 3, bypass socket 2. In other cases you can install on sockets 2 and 4, the result is the same as so.

To make dual channel installation easy, most manufacturers use the same color for sockets 1 and 3, different colors for sockets 2 and 4, see Figure 4. That's why to enable dual channel you simply need to look at the colors of the sockets.

Note: only one manufacturer that does not follow this mechanism is MSI; On most motherboards manufactured from this manufacturer, sockets 1 and 2 use the same color, while sockets 3 and 4 use a different color, as shown in Figure 6. So the boards of MSI does not follow any color code.

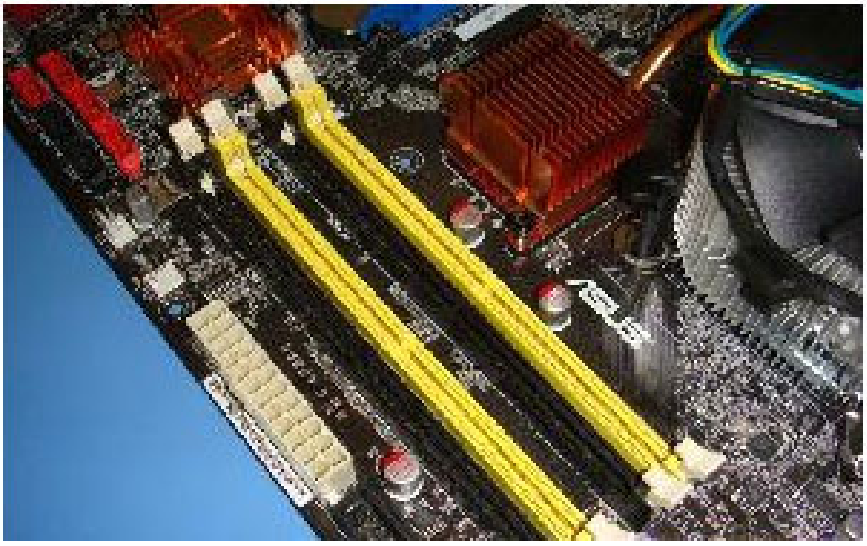


Figure 4: Arrange memory sockets on a socket 775 motherboard (Intel)

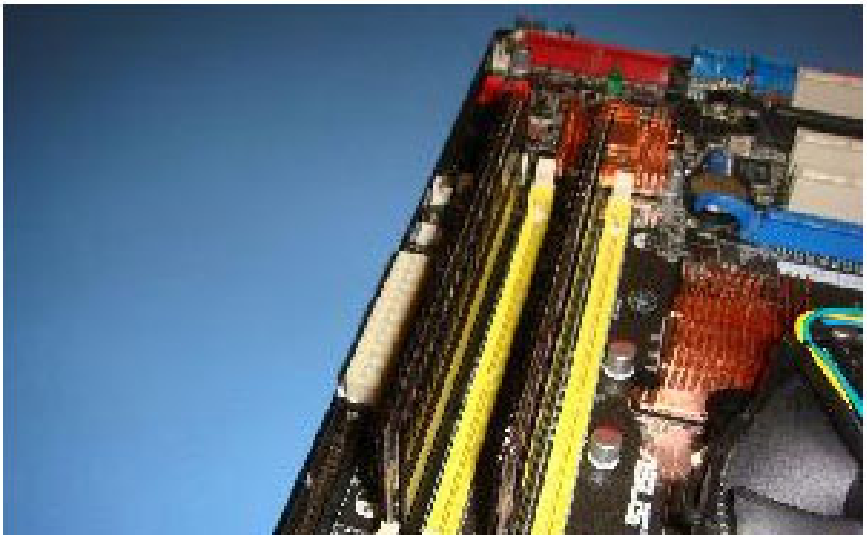


Figure 5: Dual channel mode (there is an empty socket between the other two sockets)

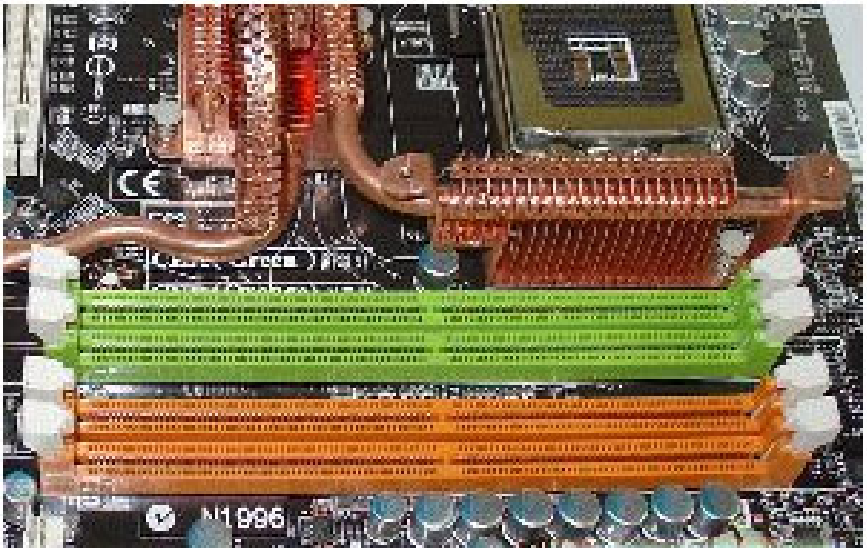


Figure 6: MSI uses a different color scheme for sockets

Here are some more technical explanations: sockets 1 and 2 are physically connected to 'A' and sockets 3 and 4 are physically connected to 'B'. When you install memory modules on sockets 1 and 3 or 2 and 4, you are installing memory modules on each different channel, so you have 128-bit access mode enabled. If you install memory modules on the same channel (by installing them on sockets 1 and 2 or 3 and 4), the memory controller will only recognize the 64 bit device and therefore dual channel mode will not be enabled. active.

It is slightly different to enable dual channel mode on systems built on AMD CPUs. Let's look at the difference here.

The motherboards are for AMD CPUs

You can see the motherboards for AMD microprocessors use the same described method or enable dual channel by installing the memory modules sequentially, not by way of how to skip a socket.

On Figure 7, we introduce a motherboard for AMD processors, where sockets 1 and 2 are marked with yellow and sockets 3 and 4 are purple. To enable dual channel on this motherboard, we need to install our memory modules on the same color sockets, see Figure 8.

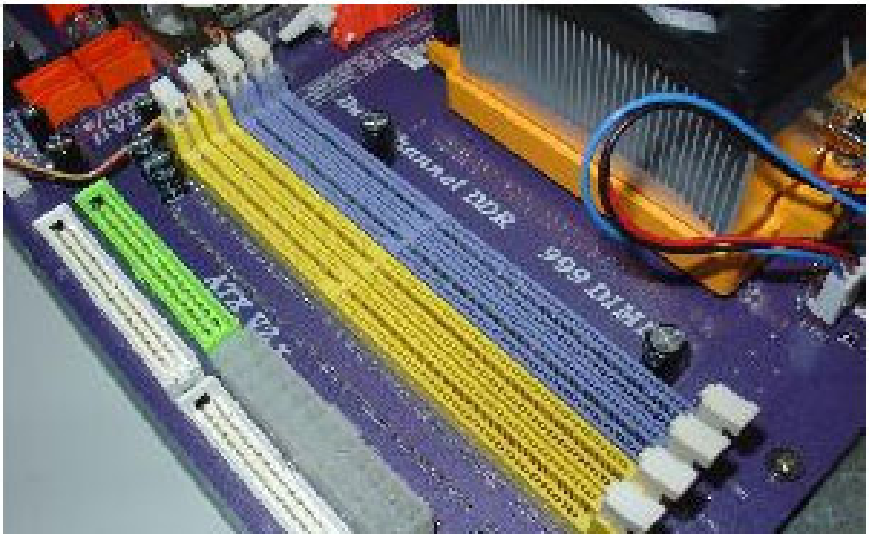


Figure 7: Installing memory sockets on socket 939 motherboard (AMD)

Figure 8: Memory modules are correctly installed in dual channel mode.

Check if Dual-Channel is enabled

After installing your memory modules, the last step is to check if they actually work in dual channel mode.

Most motherboards now display this information on POST, the screen appears on the right when you turn on the computer, showing some information about your system. Look at phrases like ' **Dual Channel** ' and ' **Single Channel** ' in Figure 9.

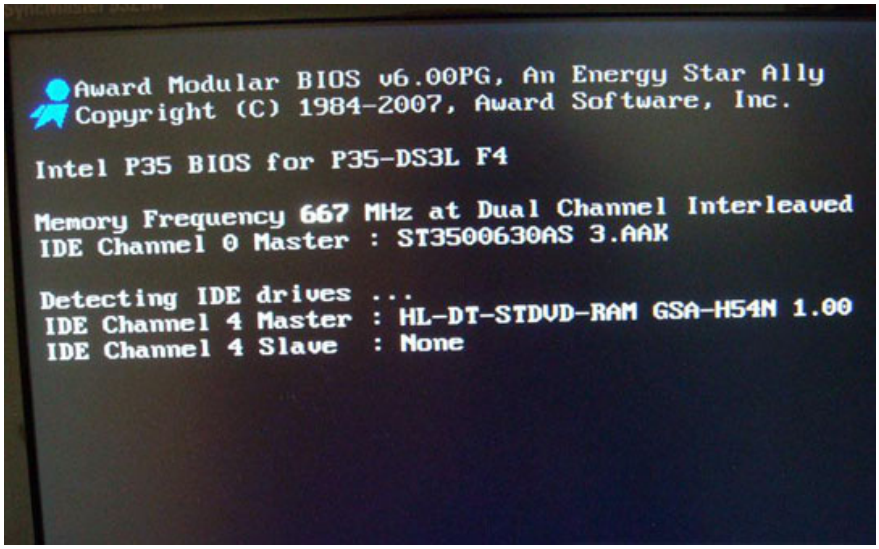


Figure 9: The computer has dual channel enabled (you can see the phrase 'at Dual Channel' in the picture above).

Another way to test this problem is to run a hardware identification utility. We show you the CPU-Z utility and check the memory information displayed in its Memory tab, see Figure 10. You can see whether dual channel mode is enabled in ' Channels # ', usually reported as' Dual' or not. Also at the top of this screen, you can check the real memory clock rate and timing. It should be noted that the actual clock rate is only half that of the announced clock rate. In our example (Figure 10), the memory is accessed at clock frequency 333 MHz, meaning '667 MHz'. This is an effective way to check if your memory is accessible at their maximum speed. If not, you need to check to see if something goes wrong (usually a configuration error in the motherboard settings or restrictions from the CPU or chipset - for example, if you have an Intel computer and chipset only Supporting DDR2-677, you cannot expect to have DDR2-800 memory modules.

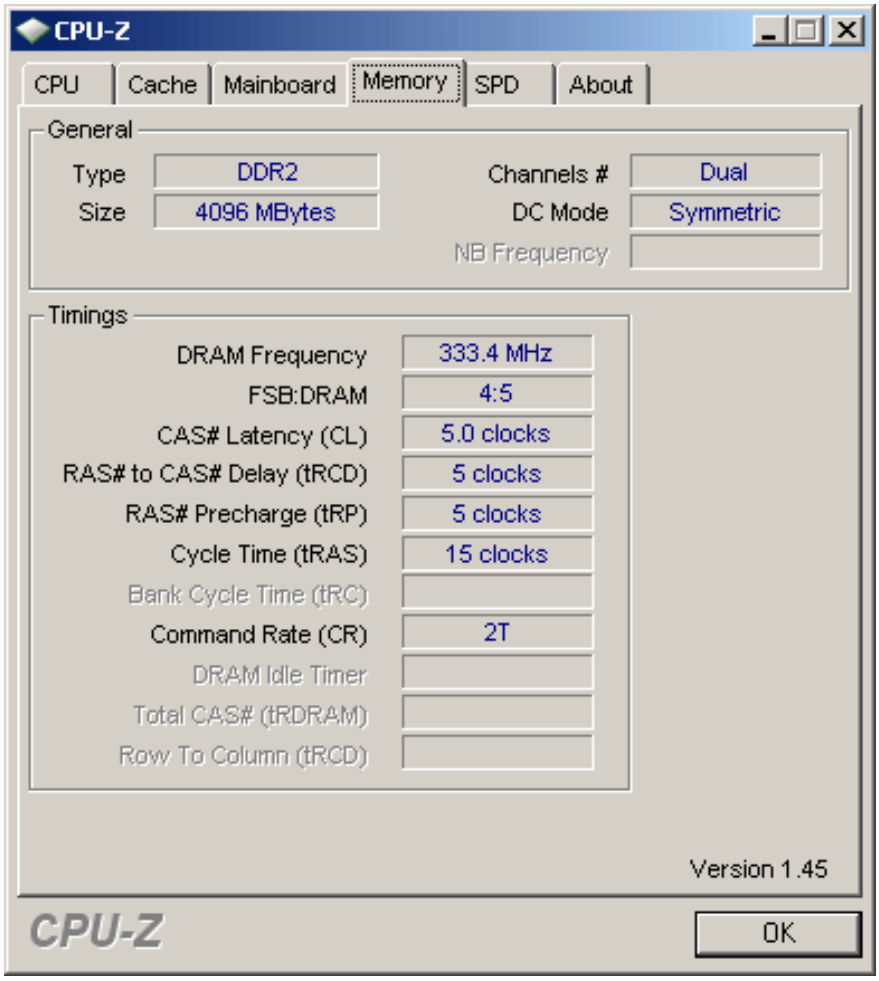


Figure 10: The dual channel computer has been activated correctly (you will see the word 'Dual').

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