

Dual channel mode for DDR, DDR2, DDR3 and DDR4

5-7 minutes

Broadly speaking, in theory a Dual Channel configuration doubles the data transfer rate of your system compared to Single Channel mode: A matching module pair is bundled along with parallel access to both memory channels.

Below, we will explain, which requirements and configurations are necessary for Dual Channel mode operation. First, we are looking at the Dual Channel mode of chip sets for DDR1 DRAM such as Intel i865, i875, in AMD-CPU integrated Northbridge etc. ([Dual Channel with symmetrical assembly](#))

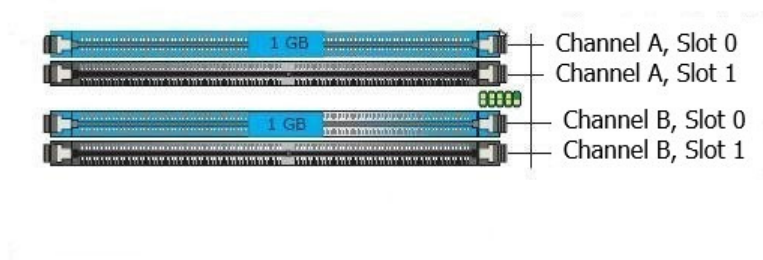
During its development stages, the Dual Channel mode was improved and the requirements for modules were modified as well. This is why newer chip sets for DDR2 RAM provide extended possibilities for DDR2, DDR3 and DDR4 systems such as the [Dual Channel \(Interleaved\) mode](#) or the [Flex mode](#).

Overview memory configurations:

- [Dual Channel with symmetric assembly \(2 or 4 DIMMs\)](#)
- [Dual Channel \(Interleaved\) mode \(2, 3 or 4 DIMMs\)](#)
- [Single Channel \(Asymmetric\) mode](#)
- [Flex mode](#)

Dual Channel mode with symmetric assembly – 2 or 4 DIMMs

The Dual Channel mode is activated by the system one by one for each memory channel if you insert two identical DIMMs as follows:



Requirements for Dual Channel mode

- Arrangement of the DIMMs in pairs in every memory channel (module pair)
- Identical module capacity of the module pair (128MB, 256MB, 512MB, 1GB, etc.)
- Identical DRAM technology of the module pair (128MB, 256MB, 512MB or 1GB)
- Identical DRAM bus width of the DRAMs used on the module pair (x8 or x16)
- Both modules either only single-sided (1 rank) or only dual-sided (2 rank)
- Mirror-inverted assembly of the memory slots

Please note: Configurations that do not fulfil these requirements, automatically work in [Single Channel mode](#).

The slowest DIMM built into the system determines the pace of the bus clock and the memory access for the complete RAM.

The following requirements within a module pair **do not have** to be fulfilled:

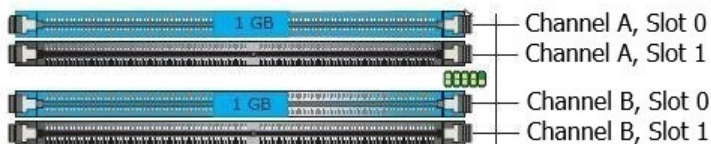
- Same manufacturer of the module or the DRAM devices
- Identical timing, access times etc.
- Same speed category of the DDR modules (PC2100, PC2700 or PC3200)

Dual Channel (Interleaved) mode

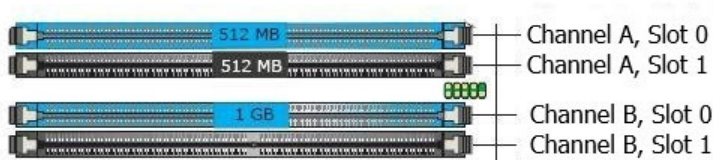
The Dual Channel (Interleaved) mode provides the highest performance. It is activated whenever the particular total capacity of the built-in modules is identical in both channels. The modules' pace and DRAM organisation can differ. The slowest DIMM built into the system determines the pace of the bus clock and the memory access for the complete RAM.

However, it is important that the total capacity of channel A and channel B is identical – a requirement that can be met with two, three or four DIMMs.

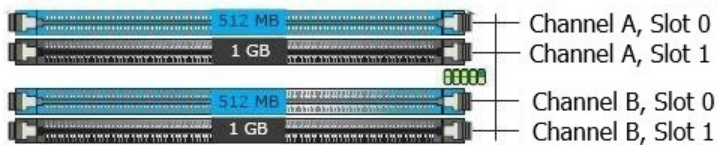
Dual Channel (Interleaved) mode configuration with *two* DIMMs



Dual Channel (Interleaved) mode configuration with *three* DIMMs



Dual Channel (Interleaved) mode configuration with *four* DIMMs



Requirements for Dual Channel (Interleaved) mode

- Arrangement of the DIMMs in both memory channels
- Identical total capacity in all memory channels (256MB, 512MB, 1GB, etc.)
- Mirror-inverted assembly of the memory slots

Please note: Configurations that do not fulfil these requirements, automatically work in [Single Channel mode](#).

The following requirements within a module pair **do not have** to be fulfilled:

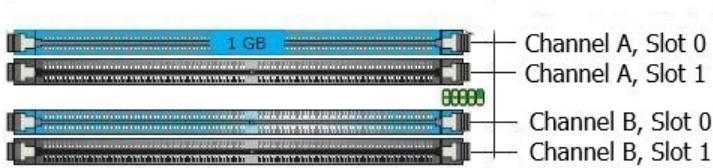
- Same manufacturer of the module or the DRAM devices
- Identical timing, access times etc.
- Same speed category of the DDR modules (PC2100, PC2700 or PC3200)
- Identical DRAM technology of the module pair (128MB, 256MB, 512MB or 1GB)
- Identical DRAM bus width of the DRAMs used on the module pair (x8 or x16)
- Both modules either only single-sided (1 rank) or only dual-sided (2 rank)
- Identical timing, access times etc.

Please note: The slowest DIMM built into the system determines the pace of the bus clock and the memory access for the complete RAM.

Single Channel (Asymmetric) mode

The Single mode is activated when the particular total capacity of the built-in modules differs in both channels. The slowest DIMM built into the system determines the pace of the bus clock and the memory access for the complete RAM.

Single Channel (Asymmetric) mode configuration with *one* DIMM



Single Channel (Asymmetric) mode configuration with *three* DIMMs

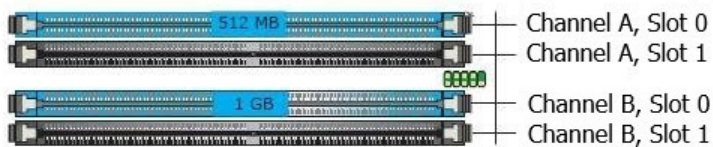


Dual Channel (Flex mode)

This new, additional technology provides highest flexibility regarding the assembly of memory modules. It rather revokes all limitations and requirements for memory modules to date. The Dual Channel mode also works when using only two, three or four DIMMs with different total capacity in the memory channels.

The highest capacity available in both memory channels is being used in Dual Channel mode. Moreover, the address range operated in Dual Channel mode is mapped in the lowest, yet initially and mostly used area. The remaining memory is being run in [Single Channel mode](#).

Dual Channel (Flex mode) configuration with two DIMMs



Requirements for the Flex mode

- One DIMM minimum in each memory channel
- Mirror-inverted assembly of the memory slots

The following requirements **do not have** to be fulfilled:

- Same manufacturer of the module or the DRAM devices

- Identical total capacity in each memory channel (256MB, 512MB, 1GB, etc.)
- Identical DRAM technology of the module pair (128MB, 256MB, 512MB or 1GB)
- Identical DRAM bus width of the DRAMs used on the module pair (x8 or x16)
- Both modules either only single-sided (1 rank) or only dual-sided (2 rank)
- Identical timing, access times etc.
- Same speed category of the DDR modules (PC2100, PC2700 or PC3200)

Please note: The slowest DIMM built into the system determines the pace of the bus clock and the memory access for the complete RAM.