



DDR FAQ

Dual Channel Kits

A growing number of motherboards support Dual Channel operation with DDR memory. To get the best performance out of Dual Channel you should always use two nearly identical pieces of memory. These kits include two matched memory dimms to make life a little easier.

184-Pin DDR Memory

DDR memory, or Double Data Rate memory, is an evolutionary new memory technology that doubles data throughput to the processor. As an evolution of today's PC133 SDRAM, DDR leverages the existing production and environment to provide unrivaled PC performance at an affordable price.

Chipkill

Chipkill is a highly advanced error correction method much more effective than standard ECC correction. Chipkill provides error correction for up to four bits per DIMM. If too many memory errors are detected chipkill technology can take the inoperative chip offline while the server is still running to keep more errors from occurring. Chipkill support is provided in the memory controller and implemented using standard ECC DIMMs, so it is transparent to the OS.

MEGAHERTZ

Beginning with the development of SDRAM technology, memory module speed has been measured in megahertz (MHz). Speed markings on the memory chips themselves are typically still in nanoseconds. This can be confusing, especially since these nanosecond markings no longer measure access time, but instead measure the number of nanoseconds between clock cycles. For SDRAM chips with speeds of 66MHz, 100MHz, and 133MHz, for example, the corresponding marking on the chips are -15, -10, and -8, respectively.

This table shows the method for determining speed equivalencies between MHz and ns ratings.

STEP 1	STEP 2	STEP 3	STEP 4
MHz = 1 million clock cycles per second	Multiply by 1 million to get total clock cycles per second	Constant: 1 billion nanoseconds per second	Divide nanoseconds per second (from Step 3) by clock cycles per second (from Step 2) to get nanoseconds per clock cycle
66	66,000,000	1,000,000,000	15
100	100,000,000	1,000,000,000	10
133	133,000,000	1,000,000,000	7.5

$$\frac{\text{nanoseconds per second}}{\text{clock cycles per second}} = \frac{1,000,000,000\text{ns}}{\text{clock cycles}} = \frac{\text{nanoseconds}}{\text{clock cycle}}$$

As noted in a previous section, the speed of the processor and the speed of the memory bus are normally not the same. The speed of memory is limited by the speed of the memory bus, which is the slowest link in the process.

YEAR INTRODUCED	TECHNOLOGY	SPEED LIMIT
1987	FPM	50ns
1995	EDO	50ns
1997	PC66 SDRAM	66MHz
1998	PC100 SDRAM	100MHz
1999	RDRAM	800MHz
1999/2000	PC133 SRAM	133MHz (VCM option)
2000	DDR SDRAM	266MHz
2001	DDR SDRAM	333MHz
2002	DDR SDRAM	434MHz
2003	DDR SDRAM	500MHz

DDR (Double Data Rate) SDRAM memory is an evolutionary product built upon the foundation of older PC100/PC133 memory technology. Unlike SDRAM memory that supports one operation per the computer's clock cycle, DDR SDRAM memory can do two operations per clock cycle, thereby doubling the memory bandwidth over the corresponding single-data-rate SDRAM.

Princeton Technology Company is an active member of JEDEC, the computer industry's standards body which developed and finalized the specifications for the DDR SDRAM modules.

DDR - The New Mainstream Memory Technology

DDR memory has been selected by the computer industry to be the mainstream memory technology moving forward. Over two thirds of the memory shipped in 2003 was DDR. It will be used in many different platforms, including desktop PCs, servers, notebooks, compact- and sub-compact computers, and networking/communications platforms.

DDR memory was selected because of its increased performance as well as its low-cost premium over SDRAM, since DDR can easily be manufactured by existing semiconductor fabrication plants and can be built and tested without significant capital investments. DDR memory delivers increased memory bandwidth and performance over SDRAM memory for many business, multimedia, and entertainment applications.

If you have further questions about DDR2 module, please contact Princeton Technology support team.

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