

7200 RPM Hard Drive Performance

Increased Speed and Productivity—33 Percent Faster Than 5400 RPM

To meet increasing demand for desktop system performance, Western Digital introduced 7200 RPM Enhanced Integrated Drive Electronics (EIDE) hard drives in January of 1999.

Western Digital's 7200 RPM hard drives meet user requirements for audio/video recording, multimedia applications, and intensive data warehousing. 7200 RPM hard drives enable users to run multiple high-end graphics and production applications simultaneously and without long waiting periods when opening files and switching between programs.

Advent of the 7200 RPM EIDE Hard Drive

Western Digital pioneered the EIDE specification to support connection of hard drives, CD-ROM, and tape drives and to break the 528 MB barrier for hard drives. In June 1994, WD became the first drive vendor to ship an inch-high, three-platter, 3.5-inch EIDE drive in a one gigabyte capacity.

Note: The EIDE interface is also known as AT Attachment or ATA. Other analogous terms include ATA-2, Fast ATA, and Ultra ATA.

The industry trend in hard drive manufacturing has been to gradually increase the drive rotational speed (RPM) of desktop hard drives, which in turn increases system performance. In the early 1980s, typical desktop drives had a rotational speed of only 3600 RPM. In the 1990s, 4500 RPM, 5400 RPM, and now 7200 RPM EIDE hard drives are available to desktop system users.

7200 RPM performance and integrated drive electronics are available from both EIDE and Small Computer Systems Interface (SCSI) drives. However, EIDE is the most popular interface used in today's hard drives, and the vast majority of PCs in current use have EIDE hard drives installed.

For most users, EIDE hard drives provide all the advantages of a high-performance, cost-effective storage solution.

Advantages of EIDE Hard Drives:

- Large installed base of PCs
- Cost-effective solution for single-user systems
- Meets requirements of most users
- Up to 7200 RPM rotational speed

The Hard Drive's Effect on System Performance

As software and operating systems become more complex and require greater disk space, increased performance from hard drives is key to maintaining an efficient, responsive system. However, many users seek the highest capacity drive for the lowest price without regard to actual drive performance.

As a critical performance component in any computer, the hard drive has as much to do with overall system speed as the processor, motherboard, modem, and CD-ROM drive. The hard drive affects how quickly Windows or Macintosh operating systems boot up, how fast applications launch, and the speed at which large files such as graphics and photos will load.

7200 RPM Performance Metrics

Mechanical factors such as seek time (head movement) and RPM (disk movement) determine a large percentage of a hard drive's performance. Of these two factors, an increase in rotational drive speed or RPM is more likely to bring about a significant gain in performance.

The reason for this is that rotational speed directly affects both access time and data transfer. The impact of disk drive movement on access time comes through a reduction in rotational latency. The data transfer rate is influenced by how fast the disks can spin past the fixed heads that read the data inside the hard drive. Drives with faster

rotational speeds will have improved performance when accessing random data locations across the disk (random read/write) or streaming large, contiguous blocks of data (sequential read/write).

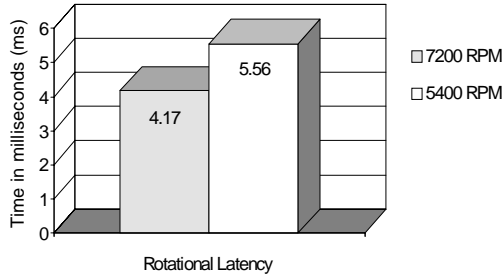


Figure 1. 7200 vs. 5400 RPM Average Rotational Latency

Thus, increasing the rotational speed affects both rotational latency and the data transfer rate:

Rotational Latency

Rotational latency is defined as the time it takes for the drive head to wait for the target sector on the drive disk to pass beneath it. The specification used to determine the length of time to complete a hard drive read/write operation is known as average rotational latency, which is one-half of the time it takes for the drive disk to complete one rotation. Thus, the average rotational latency for a 5400 RPM drive is 5.56 milliseconds (ms) and 4.17 ms for a 7200 RPM drive.

The time it takes to complete a read/write operation from the hard drive is determined by the sum of the rotational latency, seek time, command overhead time, and time to transfer data. Thus, the lower the value of rotational latency (and the higher the rotational speed), the faster a read/write operation from the hard drive can take place.

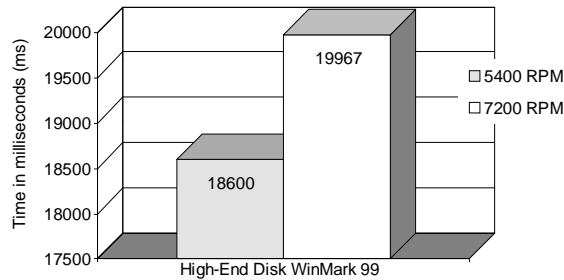
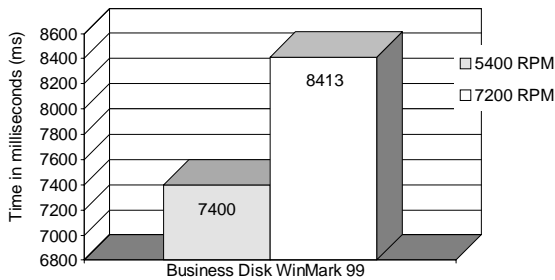


Figure 2. 7200/5400 RPM Performance Comparison on Identical System*

*Test conducted by StorageReview.com on the following system: 700 MHz, Pentium III, 128 MB PC100 SRAM DIMM, Windows 2000 Professional using NTFS.

Data Transfer Rate

The rate at which data can be read and written onto the hard drive is known as the data transfer rate. This value is determined by multiplying the sectors per track times 0.5 KB, then dividing this value by the time it takes for the drive to complete one full revolution. The faster revolution time of the 7200 RPM hard drive increases the data transfer rate over 5400 RPM drives by 33 percent.

7200 vs. 5400 RPM EIDE Performance in WinBench 99

Figure 2 compares a WD400BB 7200 RPM EIDE hard drive with a WD600AB 5400 RPM EIDE hard drive of higher capacity. Both drives were tested on the same system.

The Ziff-Davis WinBench 99 test details performance data about all of a computer's subsystems, including the hard drive. Higher numbers in WinBench indicate increased performance of the hard drive. The drives were tested on both business applications (database, spreadsheet, word processing, etc.) and high-end applications (image processing, graphics, etc.).

Summary

Western Digital established technology leadership in the 3.5-inch hard drive business for desktop PCs with the introduction of 7200 RPM EIDE hard drives.

7200 RPM drives boost data transfer rates 33 percent over 5400 RPM hard drives, providing quicker access to data stored on the hard drive. Availability of the 7200 RPM rotational speed on EIDE hard drives benefits the average desktop user looking for increased system performance.

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