## hardware

**Comparison Test**

**IN TEST: 15 HARD DISK DRIVES**

# TOO MUCH
# IS NEVER ENOUGH

**"WORK EXPANDS TO FILL
THE TIME AVAILABLE FOR
ITS COMPLETION"
– PARKINSON'S LAW**

**"DATA EXPANDS TO FILL THE SPACE
AVAILABLE FOR ITS STORAGE"
– MARCO'S COROLLARY**

**There seems to be no stopping the growth of these information storehouses, with capacities approaching 50 gigabytes.**
**Read on to find out the best storage solution for your needs**

Humans are never satisfied. From yuppie lifestyles to bank balances, there never seems to be enough. One prime example of this type of craving that we computer users can relate to is the hard disks which always seems to be 'too small' for our needs. Like a cupboard, a hard disk can never ever be big enough. From the inception of the first 10 MB device that debuted in the 1950s to the mammoth 50 GB Fibre Channel storage devices being used today in data warehouses and large enterprises, we have come a long way.

In the beginning, the use and affordability of these storage devices was restricted to a business computer or research centres. The present scenario is completely different. Now 8 GB hard disks are the norm in homes and offices. And data storage caoacities are reaching up to 20 gigabits per square inch. With the inception of new technologies data on today's hard disks can be transferred at mind-numbing rate of up to 100 MBps.

In this roundup, we have tested a range of disk drives for both the low-end home user to solutions for the enterprise server segment. Both IDE and the SCSI were tested in the two categories—below 8 GB and above 8 GB.

### Hard disks explained
When they first debuted in the 1950s, hard disks were heavy devices up to 20 inches in diameter and capable of holding just a few megabytes. These drives were originally called 'fixed disks' or 'Winchesters', which was a code name used by IBM. They later came to be known as 'hard disks' to distinguish them from 'floppy disks'. Hard disks consist of a hard platter that holds the magnetic medium, as opposed to the flexible plastic film found in tapes and floppies.

At the simplest level, a hard disk is not very different from a cassette tape. Both hard disks and cassette tapes use the same magnetic recording techniques. Information is stored in the form of magnetic flux patterns that are created during writing. These flux patterns can be 'remembered' for years. The ease of writing, erasing and rewriting at high speeds makes this a very convenient choice of data storage as compared with other available forms.

Understanding the working of a hard disk can be simplified by drawing a parallel to the conventional audio or video tape. In an audio tape, the magnetic material is coated on to a thin plastic strip whereas in a hard disk, the magnetic material is layered on to a high-precision aluminium or glass platter which is then polished to mirror smoothness. In an audio tape, the reading and recording head touches the surface directly but in hard disks, the head 'flies' microns above the surface of the platter and is never really allowed to touch the surface of the hard disk. The tape in a cassette recorder moves at a speed of about 2 inches per second. The platters of the hard disk can spin under the head at rates of up to 3,000 inches per second translating into a speed of 275 Km/h!

The information on a hard disk is stored in extremely small regions or magnetic domains which are made possible through the use of very precise control mechanisms.Due to these properties, the hard disk boasts of a very high storage density of data that can be accessed in a fraction of a second.

### The construction
The hard disk is an amazing example of perfection in the marriage of mechanics and electronics. The hard disk consists of a metallic case that hermetically seals the platter and the read-write head so as to avoid damage and corruption of the minute magnetic fields generated.

Electronically, the hard disk consists of the circuitry that handles the exchange of information to and from the drive. This circuitry also controls the movement of the drive mechanics, which consists of a motor that rotates the platters and the read-write arm. These electronics are also used to assemble the magnetic domains into bytes during the read process, while the reverse is done during the writing process. The base of the drive houses a motor that controls the spinning of the drive platters in accordance with the data being read or written.

Hard disks available today have drive platters that spin at 5,400 rpm or at 7,200 rpm. In the new generation drives they spin as fast as 10,000 rpm. These platters are manufactured to a mirror smooth finish. This is done to ensure that the read-write heads do not come into contact with the platters. The arm that controls that read-write head is responsible for moving the head to the correct location on the disk and is fabricated so as to be extremely light and manoeuvrable.

The arm on a typical drive can move the head from the hub to the perimeter of the drive and back at rates of up to 50 times per second. Nearly all hard disks contain more than one platter, to increase the data storage density.
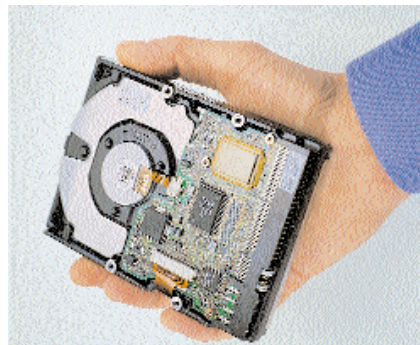
### The technology
Two types of interfaces are used in the manufacture of hard disks: IDE and SCSI. The former is cheaper and all drives used in office and home computers feature this type of drive. Controllers for IDE drives are integrated on all motherboards available today which feature installation with inherent support for up to four drives in the system. On-board SCSI interfaces are available only in very high-end motherboards.
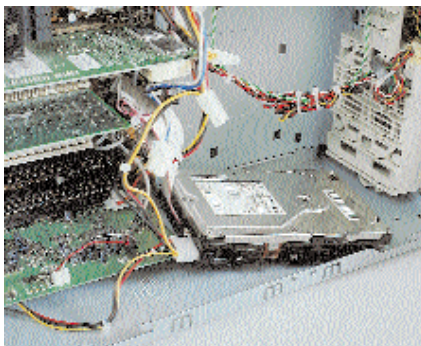
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**8** While holding a hard disk, the electronic underside should not be touched



**4** Always hold a hard disk by the edges to prevent damage due to static discharge



**8** Do not keep a hard disk on an uneven surface during operation



**4** See that the hard disk is kept on a flat surface with no strain on the cables

# GLOSSARY

**PIO:** Programmed Input/Output. This is a method of moving data between devices in a computer in which all the information must pass through the processor. The ATA/IDE standard specifies three PIO data transfer rates, namely Mode 0 at 3.3 MBps, Mode 1 at 5.2 MBps, and Mode 2 at 8.3 MBps. A newer ATA-2 standard specifies two higher data transfer rates Mode 3 at 11.1 MBps and Mode 4 at 16.6 MBps.

**Ultra DMA:** Ultra DMA or, more accurately, Ultra DMA/33 is a protocol for transferring data between a hard disk drive through the computer system bus to the computer RAM. The Ultra DMA/33 protocol transfers data in burst mode at a rate of 33.3 MBps, twice as fast as the older Direct Memory Access (DMA) interface. Ultra DMA support means that it will boot (start) and open new applications more quickly. It will also help users of graphics-intensive and other applications that require large amounts of access to data on the hard drive.

**Ultra ATA:** ATA is the acronym for Advanced Technology Attachment. It is the based upon the IDE (Integrated Drive Electronics) interface, which uses a 16-bit bus standard, but is also used in computers with other bus standards. Most computers sold today have an enhanced version of IDE called EIDE. IDE gets its name because the disk drive controller is built into the logic board in the disk drive.

**PRML:** This is a method for converting the weak analog signal from the head of a magnetic disk drive into a digital signal. PRML attempts to correctly interpret even small changes in the analog signal read from the hard disk, whereas peak

# TEST PROCESS

The test bed consisted of a PII 350 with 128 MB of 100 MHz SDRAM and a 6.3 GB Seagate ST36531A reference hard disk. During the test process, the programs are launched from this reference hard disk, but the test results are based purely upon the performance of the drive under examination. The reference hard disk does not interfere with the readings obtained. SCSI hard disks were tested on an Adaptec 2940 Ultra Wide SCSI controller card.

The test programs have been developed at the International CHIP Test Center in Munich, Germany and are in comparable to the best available. These programs measure parameters like seek time, access time and data transfer rate. This is accomplished by simulating sequential and random read and write operations on various regions of the hard disk ranging from the inner to the outer extremities of the disk surface. A 200MB dummy access database file is also used, in which random entries are accessed during this test.

The test procedure for IDE and SCSI hard disk is virtually identical. In both types, the test hard disk is initially configured to have a single partition to use all the available space and is formatted with a FAT32 file structure. For IDE hard disks, the drive under inspection is configured as the secondary master, while the reference hard disk is the primary master. In the CMOS setup, parameters that influence hard disk performance, such as the mode of access (PIO or DMA), are enabled depending on whether the hard disk can support it.

No other drives exist in the system while the test is in progress. For SCSI hard disks, the disk under test is the only device in the SCSI chain except for the controller and the SCSI ID is set to 6. Parameters in the SCSI BIOS that influence performance like the Write Buffer and Ultra Wide data transfer rates are enabled.

Upon completion of the tests, a test file that details the performance of the drive in the various test runs is created. These parameters include the average and sequential read and write access time as well as the data transfer rates. While running the tests, the first set of readings is discarded so as to stabilise the drive. This gives a truer picture of the drive performance and the readings are consistent.

# hardware

## Comparison Test



**Good read transfer rates**
**Low transfer rate during writing**
Average access time (read): 16 ms
Average access time (write): 7.77 ms
Data transfer rate (read): 9.27 MBps
Data transfer rate (write): 4.97 MBps
Interface: IDE ATA/33
Price: Rs 5,500
Contact: Godrej Pacific
Phone: 022-5182431
Fax: 022-5170415

### Fujitsu MPC3043AT
## The SOHO choice

The Fujitsu MPC 3043AT is a 7,200 rpm drive that features ATA-33 compliance and delivers very good performance. This 4.3 GB hard disk consists of two platters with four read-write heads and on-board cache of 512 KB. It supports two modes of data transfer: Ultra ATA/33 and PIO mode 4. The data transfer rates are 33.3 MBps and 16.7 MBps respectively.

This 3.5-inch form factor drive boasted of a very good sequential read rate of 9.27 MBps but was rather slow in the sequential write test, where it scored only 4.97 MBps. In the access time tests, the drive scores a time of 16 ms during random read access and 7.77 ms during the random write access. This drive is supplied in a box with anti-static packaging and it features the jumper settings on the top of the drive for configuring it as a master or a slave. An enclosed leaflet indicates the correct installation procedure and also gives a list of the parameters for setting the drive capacity manually in the BIOS.

This is a good choice for use in general home and office systems where reliable performance is required.



**Support for ATA/66**
Average access time (read): 16.6 ms
Average access time (write): 9.53 ms
Data transfer rate (read): 7.56 MBps
Data transfer rate (write): 8.26 MBps
Interface: IDE/Ultra ATA 66
Price: Rs 5,500
Contact: Godrej Pacific
Phone: 022-5182431
Fax: 022-5170415

### Fujitsu MPD3043
## New technology, low price

Like the earlier Fujitsu MPC model, the MPD 3043AT is a 5,400 rpm drive that features the new ATA-66 compliance and delivers an acceptably high level of performance. However, this hard disk was tested on a system that was Ultra ATA/33 compliant and, thus the performance observed was in accordance with the ATA/33 standard only. This 4.3 GB hard disk comprises a single platter with two read-write heads and on-board cache of 512 KB. It also features 320-bit hardware-based on-the-fly error correction to ensure data integrity. It supports three modes of data transfer, namely Ultra ATA/66, Ultra ATA/33 and PIO mode 4.

This 3.5-inch form factor drive showed a sequential read rate of 7.56 MBps with a sequential write data transfer rate of 8.26 MBps. In the access time tests, the drive scored a random read access time of 16.6 ms and 9.53 ms during the random write access. This drive is supplied in a box with anti-static packaging and it features the jumper settings on the top of the drive for configuring it as a master or a slave.

This is a good choice for use in general home and office systems.



**Easy configuration, good data transfer**
Average access time (read): 7.8 ms
Average access time (write): 10.2 ms
Data transfer rate (read): 9.2 MBps
Data transfer rate (write): 8.7 MBps
Interface: Ultra Wide SCSI
Price: Rs 13,000
Contact: Wales Technologies
Phone: 022-3828100
Fax: 022-3877418

### IBM DDRS-34560
## Fast but expensive

Part of its Ultrastar range, this 7,200 rpm Ultra Wide SCSI hard disk is a 3.5-inch form factor that displays a good rate of data transfer, both in the read and the write transfer rates. This drive features two sets of jumper blocks that allow the user to configure the various parameters and SCSI configurations like the ID and the termination. It is connected to a SCSI controller card by way of a 68-pin cable (which is not supplied with the drive). It features magneto-resistive heads, SMART (Self Monitoring And Reporting Technique) compliance and automatic error recovery circuitry for read and write processes. The drive carries 512 KB of on-board cache and is provided in an anti-static packaging.

For the data read test, the drive clocked a data transfer rate of 9.2 MBps while in the write test, it scored a transfer rate of 8.7 MBps. In the access time test, the drive displayed an average time of 7.8 ms while reading and 10.2 ms during the write processes.

With very good performance, this drive is suitable for applications like medium range network servers and graphics workstations.

## VERDICT � A

- Good transfer rates, high rotational speed

```
Average access time (read): 8.7 ms
Average access time (write): 10.2 ms
Data transfer rate (read): 11.9 MBps
Data transfer rate (write): 9. 7MBps
Interface: Ultra SCSI
Price: Rs 21,000
Contact: W ales Technologies
Phone: 022-3828100
Fax: 022-3877418
```

### IBM DDRS-39130
# The server's choice

This 9.1 GB Ultra SCSI drive from the Ultrastar range of hard disks is very similar to the 4.5 GB version with a high level of performance. This hard disk spins at 7,200 rpm and is composed of five individual platters with ten read-write heads. It features SMART compliance and the jumper block on the rear of the drive allows the configuration of the device. This 3.5-inch drive features magneto-resistive heads and has a provision for connecting the HDD LED directly to the hard disk. For added data protection, this drive also features on-the-fly enhanced ECC.

The drive is connected to the SCSI controller card through a 68-pin interface, but the connecting cable is not supplied with the drive.

In the data transfer test, the drive clocked 11.9 MBps while reading and 9.7 MBps in the write test. In the access time test, the drive displayed an average time of 8.7 ms while reading and 10.2 ms during the write processes.

Like the 4.5 GB drive in its range, the DDRS-39130 is a good performer and is well suited for use in network servers and high-end graphics workstations.

## VERDICT ⚪circled A+

- High transfer rates, large buffer
- Very expensive

```
Average access time (read): 8.9 ms
Average access time (write): 12.7 ms
Data transfer rate (read): 13.7 MBps
Data transfer rate (write): 12.6 MBps
Interface: Ultra SCSI
Price: Rs 45,000
Contact: W ales Technologies
Phone: 022-3828100
Fax: 022-3877418
```

### IBM UltraStar 18XP DGHS
# The high performance Goliath

The largest drive in this roundup, IBM's monstrous Ultra Wide SCSI based 18.2 GB hard disk delivered respectable performance. An especially good feature in this drive is the huge 1 MB buffer that greatly helps the data transfer rates and provides sustained performance in applications that frequently access the drive. This is why the UltraStar 18XP is aimed at access enterprise applications such as file and network servers and data mining applications, where there is a high level of data traffic to and from the hard disk. In order to achieve

this capacity in an industry standard packaging, five individual platters in the drive with  ten read-write heads have been used. It clocked a sequential data read rate of 13.7 MBps and 12.6 MBps in the sequential write test. For the access times, the random read and the write times logged were 8.9 ms and 12.7 ms respectively. These readings made it the fastest drive in data read rate in this roundup. In applications that require repetitive and high-speed data access, this drive is well suited due to its large buffer and rotational speed.

## VERDICT ⚪circled A+

- Good transfer rates
- Slow read access rate

```
Average access time (read): 15.6 ms
Average access time (write): 7.56 ms
Data transfer rate (read): 11.3 MBps
Data transfer rate (write): 9.21 MBps
Interface: IDE
Price: Rs 5,250+taxes
Contact: Samsung (India)
Phone: 011-6932517
Fax: 011-6932607
```

### Samsung SV0432A
# For the home user

The smallest in Samsung's range of IDE hard disks, one proved to be the fastest among them in the read data transfer rates. This 4.3 GB disk, with its single 4.3 GB platter, is Ultra ATA compliant. Spinning at 5,400 rpm, this 3.5-inch form factor drive features a concise listing of the jumper settings on the back of the drive. The jumper block located on the rear of the hard disk allows the user to set the mode of use such as master and slave. Electronics for controlling the functioning of the drive are located on a board on the underside of the drive. The drive comes in an

anti-static packaging and features the Ultra-ATA/33 interface. A special feature of this drive is the 63G operating shock that it claims to withstand. For the sequential read test, the drive logged a fast transfer rate of 11.3 MBps and 9.21 MBps in the sequential write test. In the random read tests, the access time was 15.6 ms, while it showed a very low time of 7.56 ms in the random write test.

This drive exhibited very commendable performance and its low price makes it well-suited to the home and the office for applications that need speed.

# hardware

## Comparison Test

### Samsung SV0643A
## Good performer, good price

**Good transfer rates**
Average access time (read): 16.1 ms
Average access time (write): 9.3 ms
Data transfer rate (read): 10.7 MBps
Data transfer rate (write): 9.03 MBps
Interface: IDE
Price: Rs 6,000+taxes
Contact: Samsung (India)
Phone: 011-6932517
Fax: 011-6932607

The second in its range of SpinPoint IDE hard disks, this one also consists of two platters and churned out respectable scores in both the data transfer and the access time tests. The scores put it among the best in its range. The SV0643A is an Ultra ATA compliant hard disk and spins at 5,400 rpm. This 3.5-inch form factor drive spins at 5,400 rpm and features a concise listing of the jumper settings on the back of the drive. The jumper block located on the rear of the hard disk allows the user to set the mode of use. Circuitry for controlling the drive are located on a board on the underside of the drive. The drive comes in an anti-static packaging and features the Ultra ATA/33 interface with a maximum possible transfer rate of 33.3 MBps. For the sequential read test, the drive logged a fast transfer rate of 10.7 MBps and 9.03 MBps in the sequential write test. In the random read tests, the access time was 16.1 ms, while it showed a time of 9.3 ms in the random write test.

With premium performance at a low price, this drive is the ideal choice for the home or office PC.

### Samsung SV0644A
## The speedy IDE

**Attractive pricing, good performance**
Average access time (read): 13.3 ms
Average access time (write): 8.98 ms
Data transfer rate (read): 11.4 MBps
Data transfer rate (write): 9.47 MBps
Interface: IDE/ Ultra ATA 33
Price: Rs 6,000+taxes
Contact: Compuage
Phone: 022-3851573
Fax: 022-3877836

This 5,400 rpm Ultra ATA 33 compliant hard disk features maximum data transfer rates of 33.3 MBps and SMART capability. It is aimed at the home and the office user and contains a 512 KB on-board buffer. The drive comprises two platters and four heads, with a formatted capacity of 6.4 GB and is supplied in a protective anti-static sheath. While in operation, the drive is capable of withstanding a shock of 10G, and can sustain a 75G shock when non-operational.

Like the other drives in the SpinPoint range of Samsung's hard disk drives, this one features the jumper listing and configuration settings on the drive. In the data transfer rate test, the drive delivered 11.4 MBps during read operations and 9.47 MBps during the write test, while in the random access time test, it scored 13.3 ms and 8.98 ms in the read and write tests respectively. This put the drive in the middle of its range and slightly faster than its 4.3 GB counterpart.

With its reasonable pricing and good performance, the Samsung SV0644A is a reasonable choice for domestic and general office applications.

### Samsung SV0844A
## Low price, decent performance

**Impressive data transfer rates**
**Slow read access rate**
Average access time (read): 16.1 ms
Average access time (write): 13 ms
Data transfer rate (read): 10.9 MBps
Data transfer rate (write): 8.82 MBps
Interface: IDE
Price: Rs 6,500+taxes
Contact: Samsung (India)
Phone: 011-6932517
Fax: 011-6932607

This 8.4 GB IDE from Samsung's SpinPoint range proved to be an able performer. It is well suited to the power home user as well as the office user where an acceptable level of performance is required. The SV0844A is Ultra ATA compliant and spins at 5,400 rpm. This 3.5-inch form factor drive contains two platters and features a clear and accurate listing of the jumper settings on the back of the drive.

The jumper block located on the rear of the hard disk allows the user to set the mode of use (master and slave). The drive comes in an anti-static packaging and features the UltraATA/33 interface with a maximum possible transfer rate of 33.3 MBps. In the sequential read test, the drive logged a speedy data transfer rate of 10.9 MBps and 8.82 MBps in the sequential write test. In the random read tests, the access time was 16.1 ms, while it showed a time of 13 ms in the random write test.

With superior performance at a good price, this drive is the ideal choice for the PC that is to be used for multimedia applications and gaming.

# hardware

## Comparison Test

### Seagate ST34310A

## A popular choice

**A**imed at the regular home and low-end office user, the ST34310A is an Ultra DMA drive that delivers average performance at a reasonable price.

This 3.5-inch form factor drive spins at 5,400 rpm and features a listing of the jumper settings on the back of the drive, which are clear and accurate. The jumper block that allows the user to set the mode of use like master and slave, is located on the rear of the unit, between the power and data connector. The drive comes in an anti-static packaging and features the UltraATA/33 interface with a maximum transfer rate of 33.3 MBps . DiskWizard is supplied on the accompanying floppy and allows the user to partition and initialize the drive. In the sequential read test, the drive logged a data transfer rate of 3.77 MBps and nearly double that (6.22 MBps) in the sequential write test. The average read and write access time was a respectable 17.1 ms and 11 ms respectively. In the random read test, the access time was 16.85 ms, while it clocked 14.29 ms in the random write test.

With acceptable performance at a good price, this drive is a good choice for a home PC that will be used for applications like browsing and word processing.

```
✦ Economically priced
- Low data transfer rates
Average access time (read): 17.1 ms
Average access time (write): 11 ms
Data transfer rate (read): 3.77 MBps
Data transfer rate (write): 6.22 MBps
Interface: IDE / Ultra ATA 33
Price: Rs 5,300
Contact: ACI
Phone: 022-8595682
Fax: 022-8522454
```

### Seagate ST34520A

## Fast drive, overheats during operation

**T**his Ultra SCSI hard disk from Seagate proved to be a very able performer and did very well in both the read and the write tests. It features Ultra Wide SCSI with data transfer rates up to 40 MBps. This 3.5-inch form factor drive, like all other Seagate drives in its range, feature a 68-pin Ultra SCSI connector that interfaces the drive to the adapter card. There is a jumper block between the power connector and the data interface for configuring the SCSI ID on the drive. This jumper block also allows the connection of an LED for monitoring drive access. Termination is automatically established and can be configured through the SCSI adapter itself. As with all SCSI hard disk drives, this one generated a lot of heat during operation and would require efficient cooling when used in a system.

Performance in the random read access time was a respectable 14.7 ms and 15.1 ms in the random write access. For both the sequential read and write data transfer rates, the drive logged a rating of an average of 12 MBps .

With its very high data transfer rates, this is the ideal hard disk for the power user in office applications and in graphics workstations.

```
✦ Very high data transfer rates
Average access time (read): 14.7 ms
Average access time (write): 15.1 ms
Data transfer rate (read): 12 MBps
Data transfer rate (write): 12 MBps
Interface: Ultra SCSI
Price: Rs 10,750
Contact: ACI
Phone: 022-8595682
Fax: 022-8522454
```

### Seagate ST36531A

## Good entry level choice

**T**he second in its range of Medalist hard drives, the ST36531A is aimed at the regular home and low-end office user. This is a 3.5-inch form factor, 5,400 rpm drive, which features a clear and accurate listing of the jumper settings. Like the others in the range, this one also features a tabular explanation of the jumper block that allows the user to set the mode of use. This is located on the back of the unit, where all the drive parameters are noted in case one has to manually enter them. The drive comes in an anti-static packaging and features the UltraATA/33 interface with a maximum transfer rate of up to 33.3 MBps. The DiskWizard software allows the user to partition and installing the drive. In the sequential read test, the drive logged a data transfer rate of 6.49 MBps and a nearly equal rate of 6.19 MBps in the sequential write test. The average access times were a bit slow at 18.4 ms in read and 10.3 ms in the write tests respectively.

With acceptable performance at a low price, this drive is a good choice for a home PC that is to be used for applications like browsing and word processing.

```
✦ Economically priced
- Unimpressive access time
Average access time (read): 18.4 ms
Average access time (write): 10.3 ms
Data transfer rate (read): 6.49 MBps
Data transfer rate (write): 6.19 MBps
Interface: IDE / Ultra ATA 33
Price: Rs 6,500
Contact: ACI
Phone: 022-8595682
Fax: 022-8522454
```

# hardware

## Comparison Test

### Seagate ST38421A U4
## The next generation

**VERDICT** A+

◆ Good Price/performance and protec-
tion
Average access time (read): 14.9 ms
Average access time (write): 15.3 ms
Data transfer rate (read): 7.91 MBps
Data transfer rate (write): 9.13 MBps
Interface: IDE/Ultra ATA 33
Price: Rs 7,300
Contact: ACI
Phone: 022-8595682
Fax: 022-8522454

One of the newest IDE drives from Seagate, the U4 series of hard disks feature many small embell-ishments that increase drive protection. The most noticeable is the protective anti-static jacket that serves to protect the underside of the drive where all the elec-tronics are located.

Also, the claimed non-operational shock that the drive can withstand is 300G—the highest in the industry. It is available in the 3.5-inch form factor and this range of drives is targeted at the home and office user. The U4 range of drives will be gradually replacing the other drives in its range.

The performance of the hard disk was in the middle to high level in its range. In the random read test, the drive logged an access time of 14.9 ms, while it showed 15.3 ms in the random write access. In the sequential read test, the data transfer rate recorded was 7.91 MBps, while in the sequential write test, the drive logged a data transfer rate of 9.13 MBps.

Attractive pricing and good perform-ance make this drive ideal for the budget home and office computers.

### Seagate ST38641A
## The office user's choice

**VERDICT** B+

◆ Economical price, good performance
Average access time (read): 18.4 ms
Average access time (write): 11.2 ms
Data transfer rate (read): 6.59 MBps
Data transfer rate (write): 6.09 MBps
Interface: IDE / Ultra ATA 33
Price: Rs 7,800
Contact: Micro Masters
Phone: 022-3880597
Fax: 022-3800998

This 3.5-inch form factor IDE drive is a 5,400 rpm drive that is ATA 33 com-pliant. Like the other Seagate drives, it features a listing of the jumper settings on the back of the drive, which are clear and accurate. The jumper block that allows the user to set the mode of use like master and slave, is located on the rear of the unit, between the power and data connector.

The drive comes in an anti-static pack-aging and features the Ultra ATA/33 inter-face with a maximum transfer rate of 33.3 MBps. For initialising and partitioning the drive, Seagate supplies the DiskWizard software on an accompanying floppy.

In the sequential read test, the drive logged a data transfer rate of 6.59 MBps and 6.09 MBps in the sequential write test. In the average read and write access tests, the drive scored a read time of 18.4 ms and 11.2 ms respectively.

With acceptable performance at a rea-sonable price, this drive provides ample storage space for most applications like home gaming or for office applications like applications that are not too taxing. Also, the low pricing makes this drive a good choice.

### Seagate ST39140
## For the power user

**VERDICT** A+

◆ High, sustained data transfer speeds
Average access time (read): 14.9 ms
Average access time (write): 15.3 ms
Data transfer rate (read): 12.1 MBps
Data transfer rate (write): 12.1 MBps
Interface: Ultra SCSI
Price: Rs 17,500
Contact: ACI
Phone: 022-8595682
Fax: 022-8522454

Like the smaller 4.3 GB version, the ST39140 Ultra SCSI hard disk from Seagate delivered rock solid perform-ance in both the read and the write tests. Due to the Ultra Wide SCSI interface, it is capable of supporting data transfer rates up to 40 MBps.

There is a jumper block between the power connector and the data interface for configuring the SCSI ID on the drive and it is linked to the SCSI controller through a 68-pin Ultra SCSI connector. The jumper block also allows the connec-tion of an LED for monitoring drive access and termination is automatically estab-lished. As with the prior SCSI hard disk, this one also generated a lot of heat dur-ing operation and would need a cooling system when used in a computer.

Performance in the random read access time was 14.9 ms and 15.3 ms in the random write access. For both the sequential read and write data transfer rates, the drive logged a solid 12.1 MBps.
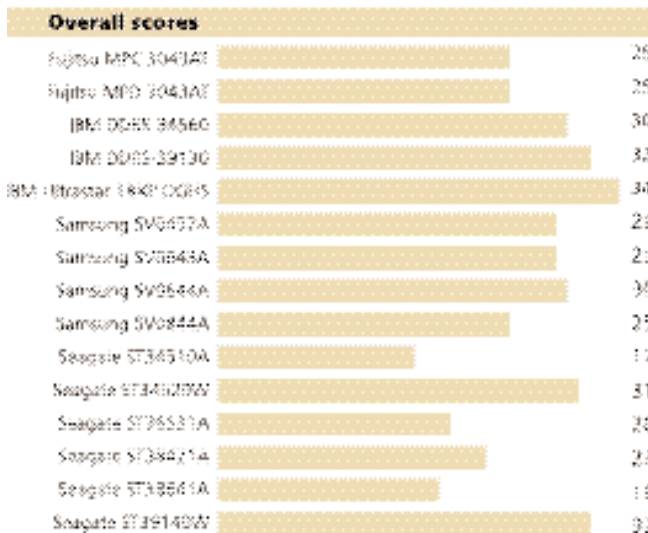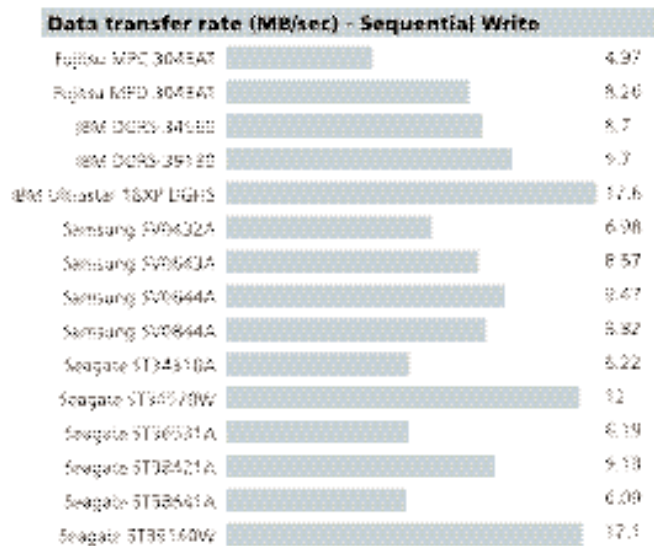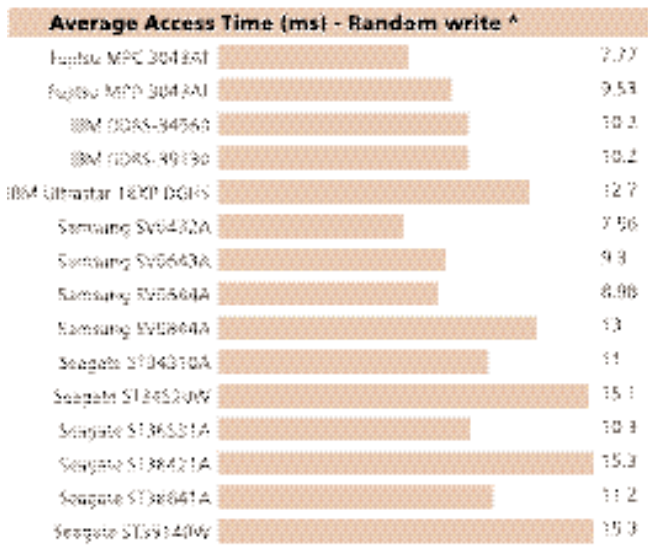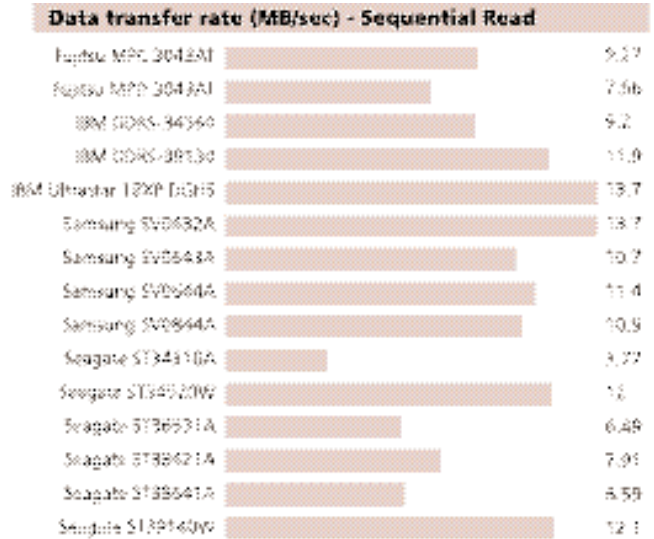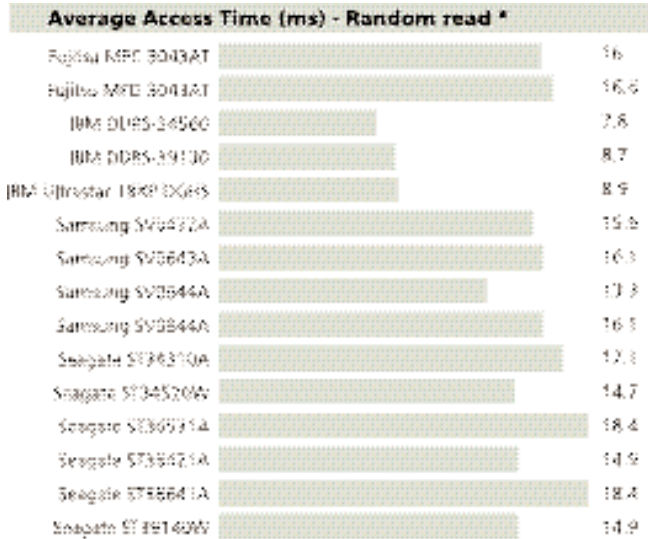
The ST39140 also features very high data transfer rates, this is the ideal hard disk for use in applications that require sustained and high data transfer rates.

# hardware

## Comparison Test

# VITALSTATISTICS

### Average Access Time (ms) - Random read *

| Drive | Value |
|---|---|
| Fujitsu MPC 3043AT | 16 |
| Fujitsu MPD 3043AT | 16.6 |
| IBM DGHS-34560 | 7.8 |
| IBM DDRS-39130 | 8.7 |
| IBM Ultrastar 18XP DGHS | 8.9 |
| Samsung SV0432A | 15.6 |
| Samsung SV0643A | 16.3 |
| Samsung SV0644A | 17.3 |
| Samsung SV0844A | 16.5 |
| Seagate ST36310A | 17.3 |
| Seagate ST34520W | 14.7 |
| Seagate ST36531A | 18.4 |
| Seagate ST38421A | 14.9 |
| Seagate ST56641A | 18.4 |
| Seagate ST39140W | 14.9 |

### Data transfer rate (MB/sec) - Sequential Read

| Drive | Value |
|---|---|
| Fujitsu MPC 3043AT | 9.27 |
| Fujitsu MPD 3043AT | 7.96 |
| IBM DGHS-34560 | 9.2 |
| IBM DDRS-39130 | 11.0 |
| IBM Ultrastar 18XP DGHS | 13.7 |
| Samsung SV0632A | 13.7 |
| Samsung SV0643A | 10.7 |
| Samsung SV0644A | 11.4 |
| Samsung SV0844A | 10.9 |
| Seagate ST34310A | 9.27 |
| Seagate ST34520W | 13 |
| Seagate ST36531A | 6.49 |
| Seagate ST38421A | 7.91 |
| Seagate ST38641A | 6.59 |
| Seagate ST39140W | 12.1 |

### Average Access Time (ms) - Random write ^

| Drive | Value |
|---|---|
| Fujitsu MPC 3043AT | 7.77 |
| Fujitsu MPD 3043AT | 9.53 |
| IBM DGHS-34560 | 10.3 |
| IBM DDRS-39130 | 10.2 |
| IBM Ultrastar 18XP DGHS | 12.7 |
| Samsung SV0432A | 7.56 |
| Samsung SV0643A | 9.3 |
| Samsung SV0644A | 8.98 |
| Samsung SV0844A | 13 |
| Seagate ST34310A | 11 |
| Seagate ST34520W | 15.1 |
| Seagate ST36531A | 10.3 |
| Seagate ST38421A | 15.3 |
| Seagate ST38641A | 11.2 |
| Seagate ST39140W | 15.3 |

### Data transfer rate (MB/sec) - Sequential Write

| Drive | Value |
|---|---|
| Fujitsu MPC 3043AT | 4.97 |
| Fujitsu MPD 3043AT | 8.26 |
| IBM DGHS-34560 | 8.7 |
| IBM DDRS-39130 | 9.7 |
| IBM Ultrastar 18XP DGHS | 12.6 |
| Samsung SV0632A | 6.98 |
| Samsung SV0643A | 8.57 |
| Samsung SV0644A | 9.47 |
| Samsung SV0844A | 9.92 |
| Seagate ST34310A | 8.22 |
| Seagate ST34520W | 12 |
| Seagate ST36531A | 6.19 |
| Seagate ST38421A | 9.18 |
| Seagate ST38641A | 6.09 |
| Seagate ST39140W | 12.1 |

### Overall scores

| Drive | Value |
|---|---|
| Fujitsu MPC 3043AT | 25 |
| Fujitsu MPD 3043AT | 25 |
| IBM DGHS-34560 | 30 |
| IBM DDRS-39130 | 32 |
| IBM Ultrastar 18XP DGHS | 34 |
| Samsung SV0432A | 29 |
| Samsung SV0643A | 29 |
| Samsung SV0644A | 36 |
| Samsung SV0844A | 25 |
| Seagate ST34310A | 17 |
| Seagate ST34520W | 31 |
| Seagate ST36531A | 20 |
| Seagate ST38421A | 23 |
| Seagate ST38641A | 19 |
| Seagate ST39140W | 32 |

34 SCSI Performance
29 IDE Value
36 IDE Performance
31 SCSI Value

* Lower number indicates better performance
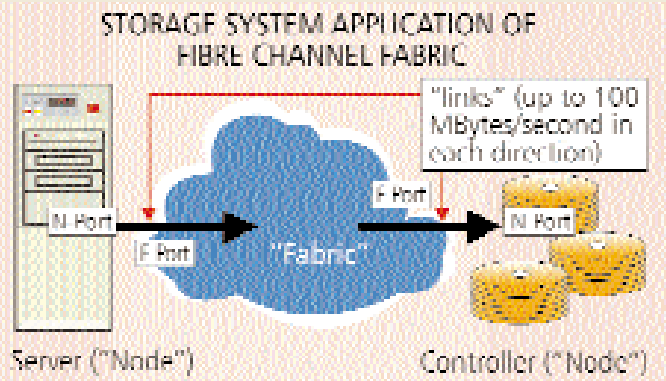
# hardware

## Comparison Test

## FIBRE CHANNEL TECHNOLOGY

The newest star on the horizon of hard disk technology, Fibre Channel is poised to redefine network data storage. This technology was invented in 1993 through a joint venture by Hewlett Packard, IBM and Sun Microsystems called the Fibre Channel Systems Initiative (FCSI). Fibre Channel technology is aimed at creating industry-wide standard in I/O interconnection that would improve performance and configuration flexibility.

In Fibre Channel jargon, the communication network is called a fabric, and each piece of equipment connected to the network is known as the node. The Fibre Channel standards are built upon the same principles that are used for connecting telephones and other instruments to the telephone network.

The figure illustrates one possible storage application for Fibre Channel. Here, both the host computer s I/O bus adapter and the disk array system controller implement Fibre Channel node ports ( N-Ports ) to connect to a Fibre Channel network (fabric). Very often, the fabric is represented as an opaque cloud to signify that its internal construction is not pre-determined by the standards.

The storage system model is the conventional store-and-forward model. Several leading storage system vendors are developing or shipping systems of this type using parallel SCSI disks.


STORAGE SYSTEM APPLICATION OF FIBRE CHANNEL FABRIC
"links" (up to 100 MBytes/second in each direction)
N Port    F Port    "Fabric"    F Port    N Port
F Port
Server ("Node")                Controller ("Node")

An alternative model using disks with N-Ports connected directly to a Fibre Channel fabric has also been proposed and is being developed by some vendors.

Fibre Channel cables used are either of copper, which can be up to 30 metres in length, or fibre optic, which features a transmission length of up to 10 Kms. In both cases, the data transfer rate is up to 100MBps. A loop topology, similar to the

## CONCLUSION  A Close Finish

In this comparison test, the hard disks evaluated were broadly categorised into the IDE and the SCSI segment. For each of the two categories, awards have been given for hard disk performance and for value. In the evaluation, factors like random access time during reading and writing were considered, along with the sequential data transfer rate during reading and writing. In both cases, the BIOS settings were kept constant.

**SCSI Performance Award:** The winner in this category was the mammoth 18.2 GB Ultra SCSI hard disk from IBM. This drive posted a data transfer rate 13.7 MBps during reading and 12.6 MBps during the writing phase of the tests. This was largely due to the 7,200 rpm rotational spin rate and the high speed Ultra SCSI interface used. Though pricey, this hard disk is the highly recommended for applications like data warehousing and data mining where frequent access and bulk volumes of information need to be stored.

**SCSI Value Award:** The 4.5 GB Seagate drive achieved the distinction of the most economical buy for SCSI hard disks. Featuring an Ultra SCSI interface, this drive delivered a sustained data transfer rate of 12MBps during both the data read test and write tests. The access times were 15.1 ms in the random write access and 14.7 ms in the random read access. For those users that require SCSI performance at a reasonable price the ST34520W is an ideal choice.

**IDE Performance Award:** For the home and office user looking for a fast IDE hard disk, the 6.4 GB Ultra ATA 33 hard disk from Samsung proved to be a very good performer with data transfer rates of 11.4 MBps and 9.47 MBps in the read and write tests, respectively.

**IDE Value Award:** The award for the most economical buy in the IDE range of hard disks went to the popular SV0432A drive from Samsung. This drive features Ultra ATA 33 compliance and spins at 5,400 rpm. A low price tag and reasonable performance, make this drive an ideal choice.

With such a wide variety of hard disks available, it is sometimes difficult to make the right choice. If you are a home user interested in performance and large capacity, a good choice would be an Ultra SCSI hard disk or one of the new Ultra ATA 66 devices like the Fujitsu MPD3043 or any other such drive. However, it will be a matter of time before motherboards that support the Ultra ATA 66 standard are available.

Otherwise, an Ultra ATA 33 IDE hard disk from Samsung or Seagate would be a good choice, since they offer reasonable performance at a very low price. For the enterprise and the network file server, one of the IBM range of Ultrastar drives that offer a high density of storage and quick access times would be best suited to the application. In networking environments the presence of a large on-board cache would be very advantageous.

As the capacities of the hard disks increase exponentially and prices fall, it will not be long before the home and office user will see hard disks in the terabyte range on their desktops.

CHIP TEST CENTRE