

## IBM Ultrastar™ 146 Z10 hard disk drives



### Highlights

- **Rotational speed of 10,000 rpm and average seek times as low as 4.7 ms provide outstanding performance**
- **Capacities of 146, 73, 36, and 18GB from a single server drive family for unrivaled configuration flexibility and ease of integration**
- **First ever server-class drive to implement antiferromagnetically-coupled (AFC) media, combined with advanced head/disk design, resulting in high reliability for today's critical server-class environments**
- **Enhanced servo technology (Rotational Vibration Safeguard) nullifies the effect of rotational vibration in multi-drive cabinets, overcoming an industry hurdle to optimal server performance**

### Advanced drive technology

Introducing the sixth generation of IBM Ultrastar\* 10,000 rpm disk drives. The IBM Ultrastar 146 Z10 drive family offers high quality and superior performance. These drives feature more powerful processors and read/write channels to excel in server-class environments.

To achieve maximum I/O performance, the drives combine fast seek times, large 8 MB multi-segmented buffers, a sophisticated command queuing algorithm, hardware automation, and superior data rates (825 Mbps). Ultrastar 146 Z10 drives include new servo technology (Rotational Vibration Safeguard "RVS"), employed to counteract the effects of rotational vibration that commonly occur in multi-drive cabinets. They also employ fifth-generation giant magnetoresistive (GMR) head technology to double areal density from previous generation drives (26.3 Gbits/sq. in.) and boost performance. In addition, highly efficient No-ID\* sector formatting enables more data to be stored per disk.

### Reliability features

The Ultrastar 146 Z10 family of server-class drives is the first of its class to incorporate IBM's latest storage breakthrough technology—antiferromagnetically-coupled (AFC)

media. Informally known as "pixie dust", this technology sandwiches a three-atom thick layer of ruthenium, a precious metal, between two magnetic layers on a disk. AFC technology provides greater stability of the recording media, thereby enhancing reliability.

IBM's Drive Fitness Test enables drive self-testing and analysis—for more robust system management. To help ensure data protection, IBM Ultrastar drives include IBM-exclusive reporting tools, such as Predictive Failure Analysis\* (to signal potential drive problems) and Drive-TIP\* (to monitor the drive temperature and avoid malfunctions).

In addition, load/unload technology and glass substrate disks also increase reliability of IBM Ultrastar drives by providing a more robust solution at high rotational speeds.

### Outstanding environmental

IBM Ultrastar drives provide extremely quiet operation. The tri-laminate drive cover reduces both idle and seek acoustics while an enhanced spindle motor driver enables smoother commutation for less noise. Moreover, the IBM Ultrastar 146 Z10 delivers an outstanding power efficient design.

## IBM Ultrastar 146 Z10 at a glance

Product name	Ultrastar 146 Z10	Ultrastar 146 Z10
Model names	IC35L018UWDY 10*, IC35L018UCDY 10** IC35L036UWDY 10*, IC35L036UCDY 10** IC35L073UWDY 10*, IC35L073UCDY 10** IC35L146UWDY 10*, IC35L146UCDY 10**	IC35L018F2DY 10 IC35L036F2DY 10 IC35L073F2DY 10 IC35L146F2DY 10

\* 68 pin interface, \*\* 80 pin interface

### Configuration

Interface	Ultra320 / Ultra160 <sup>3</sup> SCSI	FC-AL-2
Capacity (GB) <sup>1</sup>	146.8/73.4/36.7/18.3	146.8/73.4/36.7/18.3
Sector size (bytes)	512-528 (variable, 2 byte inc.)	512-528 (8 byte inc)
Recording zones	15	15
Data heads (physical)	12/6/3/2	12/6/3/2
Data disks	6/3/2/1	6/3/2/1
Max. areal density (Mbits/sq. inch)	26,263	26,263
Max. recording density (BPI)	548,000	548,000
Track density (TPI)	47,900	47,900

### Performance

Data buffer	8192 KB	8192 KB
Rotational speed (rpm)	10,000	10,000
Latency average (ms)	3.00	3.00
Media transfer rate (max. Mbits/sec)	433 - 825	433 - 825
Interface transfer rate (max. MB/sec)	320	200
Sustained data rate (MB/sec)	33.8 - 66.7	33.8 - 66.7
Seek time (read, typical) <sup>2</sup>		
Average (ms)	4.7	4.7
Track to track (ms)	0.5	0.5
Full track (ms)	10.5	10.5

### Reliability

Error rate (non-recoverable)	10 in 10E16 bits read	10 in 10E16 bits read
Start/stops (at 40° C)	50K	50K

### Acoustic

Idle - Typical (Bels)	3.7/3.4/3.4/3.4	3.7/3.4/3.4/3.4
Operating - Typical (Bels)	4.5/4.5/4.5/4.5	4.5/4.5/4.5/4.5

### Power

Requirement	+5VDC (+-5%), +12 VDC (+-5%)	+5VDC (+-5%), +12 VDC (+-5%)
Dissipation		
Startup current (max. peak)	1.07A (5V), 2.40A (12V)	1.12A (5V), 2.40A (12V)
Idle (W)	10.2/7.7/7.0/5.9	11.1/8.6/7.9/6.8
Power consumption efficiency index	0.07 W/GB, 0.11 W/GB 0.19 W/GB, 0.33 W/GB	0.08 W/GB, 0.12 W/GB 0.22 W/GB, 0.38 W/GB

### Dimensions

Height (mm)	25.4 (+-0.4)	25.4 (+-0.4)
Width (mm)	101.6 (+-0.4)	101.6 (+-0.4)
Depth (mm)	146 (+-0.6)	146 (+-0.6)
Weight (max. kg)	0.78	0.78

### Environmental characteristics (for both Ultra320 SCSI and FC-AL-2 interfaces)

Operating		
Ambient temperature	5° to 55° C	
Relative humidity (non-condensing)	8% to 90%	
Max. wet bulb (non-condensing)	29.4° C	
Shock (half sine wave)	10G (11 ms) / 45G (2 ms)	
Random Vibration (RMS)	0.67G for horizontal 0.56G for vertical	
Non-operating		
Ambient temperature	-40° to 65° C	
Relative humidity (non-condensing)	5% to 95%	
Max. wet bulb (non-condensing)	35° C	
Shock (half sine wave)	75G (11 ms) / 225G (2 ms) for 146GB / 300G (2 ms) for 73, 36, and 18GB	
Random Vibration (RMS)	1.04G	

<sup>1</sup> GB equals one billion bytes when referring to hard drive capacity; accessible capacity may be less.

<sup>2</sup> Excludes command overhead.

<sup>3</sup> Ultra160 available for a limited time.

## Support for advanced applications and interfaces

IBM Ultrastar drives provide high data throughput for data-intensive applications with a choice of 2 Gbit Fibre Channel and Ultra320 SCSI (backward-compatible) interfaces. The Ultra320 SCSI adds greater speed, reduced overhead, improved diagnostic capabilities and data protection.

## For more information

Internet and e-mail:

- [ibm.com/harddrive](http://ibm.com/harddrive)
- [drive@us.ibm.com](mailto:drive@us.ibm.com)

IBM hard drive product information:

- [1-888-IBM-5214](http://1-888-IBM-5214)
- [507-286-5825](http://507-286-5825)



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