

Models DFHC-32160,-34320

\*Best of BYTE - COMDEX/Fall '94\*  
Finalist3.5-Inch Ultrastar XP  
2 and 4 GB High-Performance  
SSA Disk Drives

IBM Ultrastar XP drives feature Serial Storage Architecture (SSA), an advanced, high-speed serial interface that enables transfer rates on a single SSA loop of up to 80 MB/sec (full duplex read/write, 2 paths). SSA facilitates migration from SCSI equipment and supports a wide variety of configurations, making it possible to connect high-capacity storage devices, sub-systems, servers and workstations.

As the function, availability, reliability, density and performance of storage subsystems increase, there is also an accompanying trend for them to become more complex. SSA not only allows such subsystems to be implemented more easily and at a lower cost than current parallel interfaces, but also permits configurations that are currently not practical.

The Ultrastar XP series of performance-optimized 3.5-inch SSA disk drives also support the requirements of critical data-intensive applications, such as digital video and multimedia. Available capacities include 2 and 4 GB. The SSA drives incorporate sector servos to eliminate performance-robbing calibrations, and maintain the high-speed uninterrupted data streams required for multimedia and digital video applications.

The superior performance characteristics of the Ultrastar XP series result from a number of factors. The 7200 RPM spin rate combined with an industry-leading areal density (544 Mbits per sq.in.), a low average seek time of 6.9 ms, and a patented PRML channel give these drives some of the fastest data rates in the industry (9.59-12.58 MB/sec).

The simple, robust design of the drives, in conjunction with the use of automated manufacturing processes, enable the Ultrastar XP series to achieve a new milestone for reliability, with a projected 1,000,000 hours MTBF. Data integrity is further assured by the application of PFA - Predictive Failure Analysis (trademark) features that monitor the drive, correct soft errors and provide advanced warning of impending drive problems. The error-checking and recovery features of the SSA interface provide additional data integrity.

IBM developed SSA and placed the specifications in the public domain in 1992. These specifications have been reviewed and approved by an industry user group and are now with the ANSI X3T10.1 subcommittee for approval as an ANSI standard. IBM and other industry vendors offer SSA parts consisting of CMOS protocol chips, evaluation kits, disk drives and a full range of testers.

## HIGHLIGHTS

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- SSA interface
- 2 & 4 GB capacities with 7200 RPM
- 9.59-12.58 MB/sec. data transfer rate
- 80 MB/sec. interface transfer rates
- Sector servo
- String, loop and switch connections
- Automatic network configuration
- Transparent frame recovery
- 1,000,000 hours projected MTBF

## PRODUCT DESCRIPTION

3.5-Inch Ultrastar XP 2 and 4 GB SSA Disk Drives			DFHC -32160/-34320
Configuration			
Interface			SSA
Formatted Capacity (512 bytes)			2255/4512 MB (1)
Number of Disks			4/8
Number of Heads			8/16
Areal Density	Maximum		544 Mbits/sq.in.
Recording Density	Maximum		125,000 BPI
Track Density			4352 TPI
Tracks per Surface			4416
Bytes per Sector			256-744
Disk Type			Thin Film
Channel			PRDF (PRML with digital filter)
Actuator Type			Rotary VCM
Head Type			Magneto-Resistive(MR)
Performance			
Media Data Rate	Banded		9.59-12.58 MB/sec.
Interface Transfer Rate	Maximum		80.0 MB/sec. (2)
Access Times (Pop.Avg.)	Avg Read		7.5/8.0 ms
	Avg Write		9.0/9.5 ms
	Track/track		0.5 ms
	Full Stroke rd		15.0/16.5 ms
Rotational Speed			7200 RPM
Command Overhead (Read)	Random		<0.28 ms
	Sequential		<0.41 ms
Buffer Size			512 KB
Reliability			
MTBF	Projected POH		1,000,000
CDF (3)			3.0% at 500 poh
Recoverable Read Errors	QPE Enabled		<10 per 10E 13 Bits
Non-Recoverable Read Errors	Population Avg.		<10 per 10E 15 Bits
Seek Errors			<10 per 10E 8 Seeks
Predictive Failure Analysis			Yes
Power Requirements			
Start-up Current	Average		1.5/2.2 Amps
Idle	Average		8.6/13.0 Watts
Read/Write	Average		10.8/15.5 Watts
Physical Size			
Height			25.4/41.3 mm
Width			101.6 mm
Depth			146 mm
Weight			0.46/0.82 kg
Mounting			Industry standard, all orientations
Environmental Characteristics			
	Operating		Non-Operating
Temperature	5 to 55 C		-40 to 65 C
Relative Humidity	5% to 90%	Non-condensing	5% to 95%
Shock (11 ms)	10 G		70 G
Vibration	0.5 G		2 G

- (1) 1MB = 1,000,000 Bytes
- (2) 20 MB/sec per link, 4 links
- (3) Cumulative Distribution Failure rate. At 1,000,000 hours MTBF, less than 3.0% of the files are projected to fail in 5 years running at 500 power-on hours per month

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