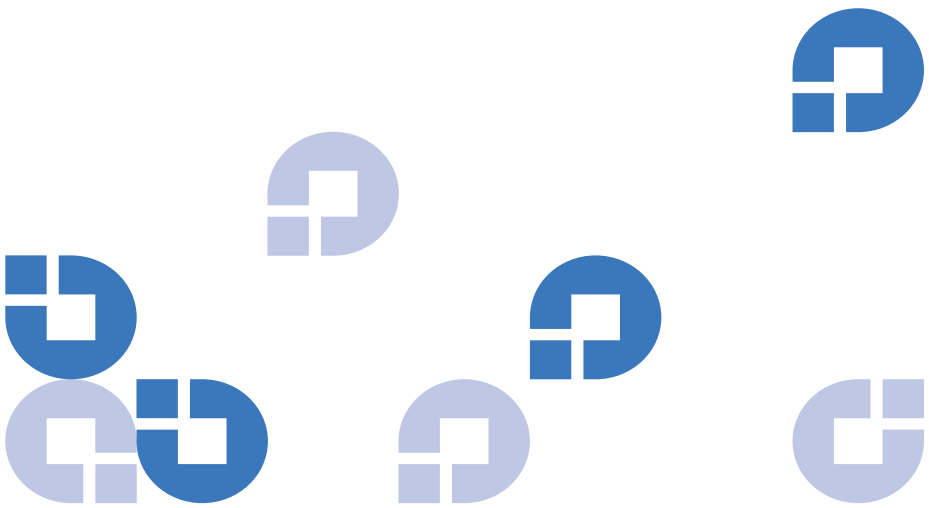
Quantum®

WHITE PAPER

SDLT 600 Performance

SDLT 600 Outperforms LTO-2 and AIT-3



Notice

The testing data referenced in this document was derived from testing performed by an independent laboratory, Percept Technology, Inc., in a controlled environment using specific systems and data sets. Actual results in other environments may vary. These results do not constitute a guarantee of performance. Testing was conducted using Linear Tape-Open (LTO) drives and media from several different LTO consortium manufacturers and AIT-3 drives and media from Sony Corporation.

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Executive Summary

A competitive analysis study was conducted to distinguish performance variations between DLTtape™, LTO and AIT tape technologies. Quantum contracted Percept Technologies, an independent Product Test and Development Firm, to conduct performance testing of SDLT tape drives, LTO-2 tape drives and AIT-3 tape drives. The drives used in this study were the Quantum SDLT 600, IBM LTO-2 Ultrium 3580, HP LTO-2 Ultrium 460, and the Sony AIT-3

The testing focused on data transfer rate performance. The measurements of data transfer rates were done for differing data block sizes. All tests used the Percept's Tape Competitive Analysis Test, TCAT.

General Conclusions

Quantum's SDLT 600 (see table 1 below) showed a strong performance advantage over the competing IBM 3580 Ultrium LTO-2, HP Ultrium 230 LTO-2, and Sony AIT-3 tape drives.

Block Size	Write or Read Mode	SDLT 600	HP LTO-2	IBM LTO-2	Sony AIT-3
64K	Write	117.0 MB/s	90.1 MB/s	113.6 MB/s	35.1 MB/s
128K	Write	118.4 MB/s	90.0 MB/s	114.1 MB/s	42.3 MB/s
256K	Write	121.7 MB/s	95.4 MB/s	114.5 MB/s	47.3 MB/s
64K	Read	111.2 MB/s	85.9 MB/s	107.9 MB/s	36.7 MB/s
128K	Read	107.4 MB/s	90.4 MB/s	108.4 MB/s	49.5 MB/s
256K	Read	111.8 MB/s	95.3 MB/s	108.7 MB/s	48.1 MB/s

Table 1. Test Results Summary (moderately compressible data)

The SDLT 600 drive's performance advantage is directly attributable to two features of the SDLT 600: 1) the pivoting optical servo system which enables the SDLT 600 to maintain proper media/head at high tape speeds and 2) the sixteen-channel MRC which enables the SDLT 600 to read sixteen channels of data at the same time.

What does this really mean for customers?

The end-user benefit of the SDLT 600's performance advantage, in terms of total cost of ownership, is significant when one considers the backup-requirements of an enterprise-class data center. A typical data center would on average need to protect 100 TB within an eight-hour backup window. The performance of the SDLT 600 provides the customer with the best return on investment (ROI) because only 29 SDLT 600 tape drives would be required while 37 HP LTO-2 or 74 Sony AIT-3 tape drives would be required to complete the same task.

Quantum's SDLT 600 drive demonstrated the fastest performance and the largest capacity of all the super tape drives tested.

Testing Objective

This White Paper describes the results of a performance study of super tape drives. The study's requirements were to compare the performance of the SDLT 600 drive against the LTO-2 drives from IBM and HP and AIT-3 drive from Sony.

Quantum contracted Percept Technologies, an independent Product Test and Development Firm, to perform this testing. Percept Technologies audited the test methodologies and procedures, performed the tests and evaluated all test results according to the test plan provided by Quantum.

Tape Drive Specifications

The tape drives included in this test were the SDLT 600 drive, IBM LTO-2 Ultrium 3580, HP LTO-2 Ultrium 460, and the Sony AIT-3. A summary of each tape drive's specifications is shown in the table below.

	SDLT 600	IBM LTO-2	HP LTO-2	Sony AIT-3
Capacity (native)	300 GB	200 GB	200 GB	100 GB
Transfer Rate (native)	36 MB/sec	35 MB/sec	30 MB/sec	12 MB/sec
Cartridge Load Time (from BOT)	12 sec	25 sec	25 sec	10 sec
AVG File Access Time (from BOT)	79 sec	71 sec	71 sec	27 sec
8 TB Library Storage Density	27 Cartridges	40 Cartridges	40 Cartridges	80 Cartridges
Interfaces	FC, SCSI	FC, SCSI	FC, SCSI	SCSI
Infrared Management Interface	Yes	No	No	No
Data Channels	16	8	8	8
Tape Format	Linear serpentine	Linear serpentine	Linear serpentine	Helical
Servo Method	Optical Servo	Magnetic Servo	Magnetic Servo	Magnetic Servo
Channel Technology	PRML	PRML	PRML	PRML
Data Compression Algorithm	DLZ	LTO ALDC	LTO ALDC	ALDC
Backward Compatibility	Yes	Yes	Yes	Yes
MTBF	250,000 @ 100%	250,000 @ 100%	250,000 @ 100%	400,000 @ 100% POH
Unrecoverable Bit Error Rate	< 1 in 1017 bits read	< 1 in 1017 bits read	< 1 in 1017 bits read	< 1 in 1017 bits read

Table 2. Specifications of tested tape drives.

Test Setup and Process

The test set-up consisted of one Tape Competitive Analysis Test (TCAT) system, one Quantum SDLT 600 tape drive, one IBM LTO-2 Ultrium 3580 tape drive, one HP LTO-2 Ultrium 460 tape drive and one Sony AIT-3 tape drive.

Given the testing objective stated above, the test process was designed to evaluate the best representative performance of each tape drive for data transfer rate performance.

All tests were repeated ten (10) times for each tape drive under the same conditions. The average of the ten test runs was recorded.

Data Transfer Rate Test

The test consisted of writing and reading ten passes each for every combination of compression on/off and block size. The tested block sizes were 64K, 128K, 256K and 512K. The total amount of data written and read for each test pass was 5.0 GB. The average write transfer rate and average read transfer rate were recorded. The total number of test passes completed for the analysis was 320. The total amount of data written and read was 1,600 GB or 1.6 TB.

Testing Results

Write Transfer Rate Performance Results

The SDLT 600 drive, in write transfer rate tests, was faster than the IBM LTO-2 Ultrium 3580, and was significantly faster than the HP LTO-2 Ultrium 230, and the Sony AIT-3 tape drives. Overall, the SDLT 600 drive wrote data on average 18% faster than LTO-2 and 178% faster than the Sony AIT-3 tape drives.

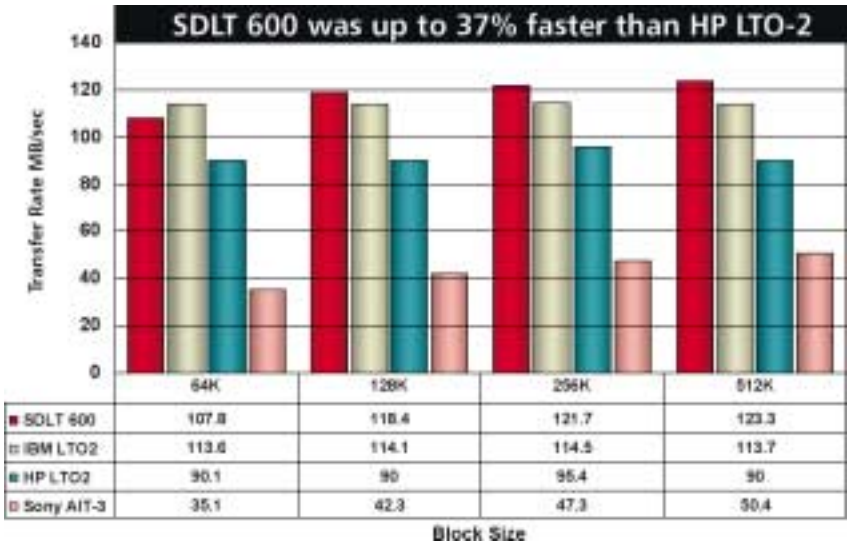

Figure 1. WRITE Transfer Rate (MB/s) Test Results w/Compression ON

Read Transfer Rate Performance Results

The SDLT 600 drive in Read Transfer Rate tests, was faster than the IBM LTO-2 Ultrium 3580, and was significantly faster than the HP LTO-2 Ultrium 230, and the Sony AIT-3 tape drives. Overall, the SDLT 600 read data on average 13% faster than LTO-2 and 149% faster than the Sony AIT-3 tape drives.

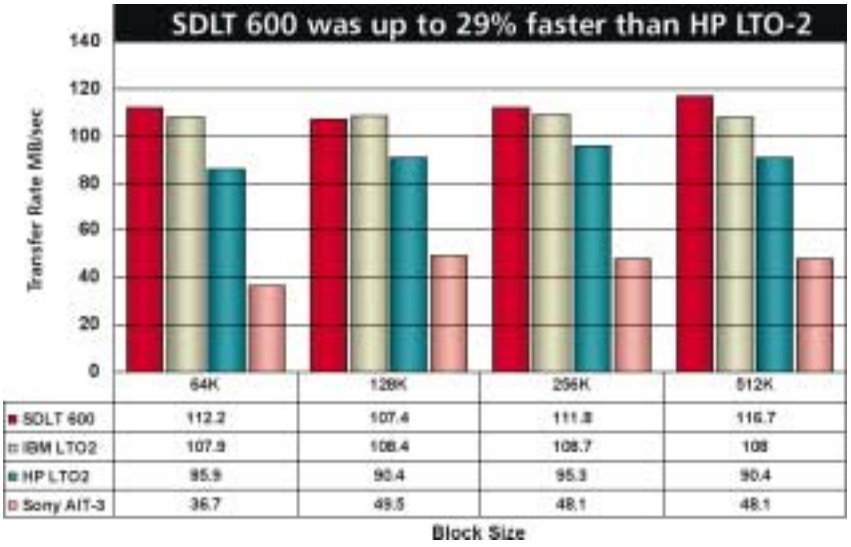

Figure 2. READ Transfer Rate Test Results w/Compression ON

Summary of Analysis
Under a series of benchmark tests to compare the performance of a new class of midrange tape drives Quantum's SDLT 600 drive showed a performance advantage over the competing IBM 3580 Ultrium LTO-2, HP Ultrium 230 LTO-2, and Sony AIT-3 tape drives.

Specifically:

1. The SDLT 600 drive write data transfer rate outperformed HP LTO-2 by up to 37% and Sony AIT-3 by up to 217%.

2. The SDLT 600 drive read data transfer rate outperformed HP LTO-2 by up to 29% and Sony AIT-3 by up to 212%.

The SDLT 600 drive's performance advantage is a direct result of its pivoting optical servo system which enables the SDLT 600 drive to maintain proper media/head at high tape movement speeds and its sixteen-channel MRC which enables the SDLT 600 drive to read sixteen channels of data at the same time.

The benefit of SDLT 600's performance advantage is that it provides a much better return on investment (ROI) for customers. Consider the case of a typical enterprise-class data center with 100 TB to protect within an eight-hour backup window. Only 29 SDLT 600 tape drives would be needed to meet the center's backup requirement while 31 IBM LTO-2, 37 HP LTO-2 or 74 Sony AIT-3 tape drives would be required.

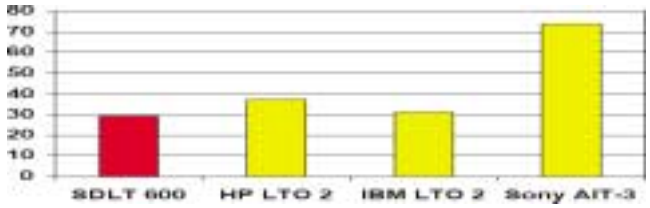

Figure 3. Total number of drives to Backup 100 TB

Additionally consider another real tangible benefit of the SDLT 600's performance advantage on the cost of an automation solution. Figure 4 compares of the cost of SDLT 600 and HP LTO-2 automation solutions when the customer has the constraint of having to back up a fixed amount of data in an eight-hour backup window. Because of the SDLT 600's performance advantage, in each case with the SDLT 600 solution the customer can achieve their backup window requirement and save money over the HP LTO-2 solution.

Figure 4. Cost of Automation Solution with 8-hour Backup Window

In conclusion, Quantum's SDLT 600 drive demonstrated the fastest performance and the largest capacity of all the super tape drives tested.

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DLT TAPE

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