IBM TotalStorage®

Solutions matérielles IBM pour la sauvegarde

Mars 2006

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IBM® TotalStorage® UltraScalable Tape Library 3584

IBM Tape Drives
What determines Best of Breed?

IBM LTO Drives

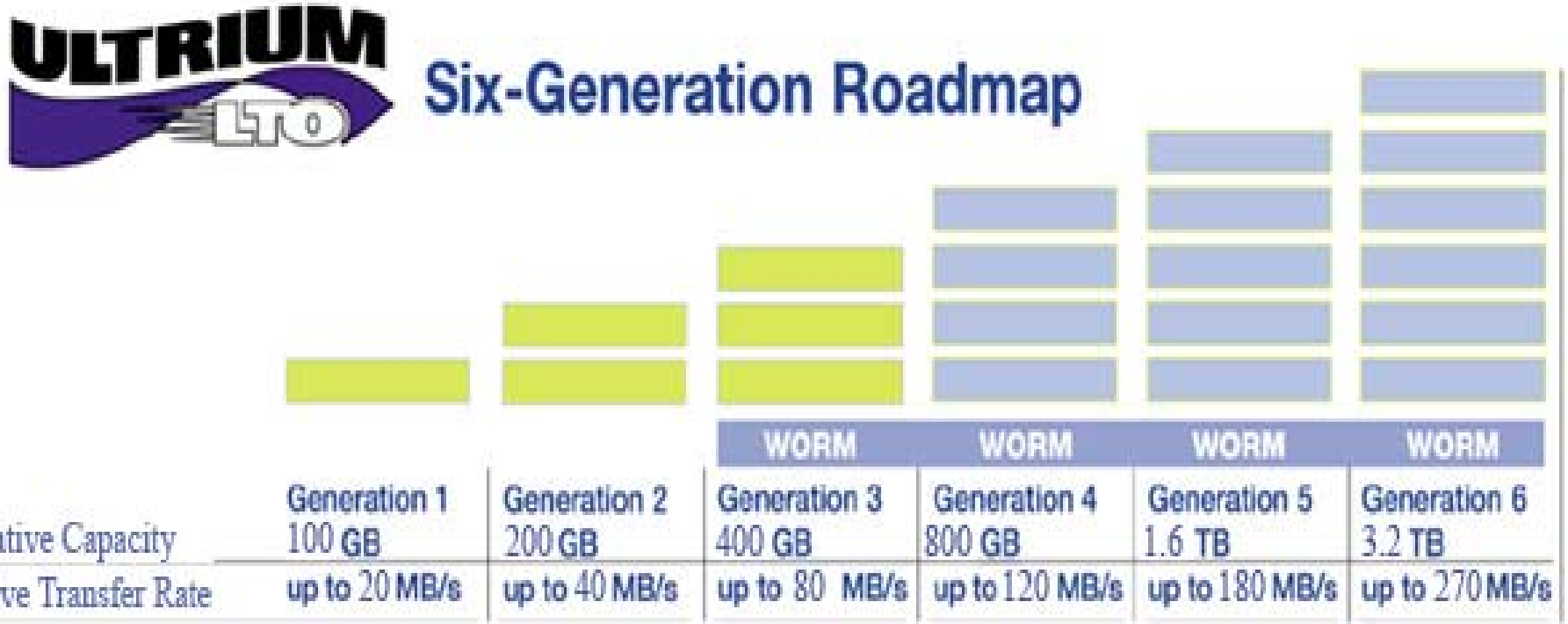
Technology Competencies

- MR Heads
- Media
- Mechanics
- Electronics / Servo
- Recording Technology
- Error Correction
- Dynamic Compression Look Ahead
- Speed Matching
- Attach Interface Architecture
- Dynamic Load Balancing
- Native Fibre Channel
- Common Libraries
- SARS (**S**tatistical **A**nalysis **R**eporting **S**ystem)

50 Years of Tape Technology

IBM 3592 Technology

Growth Plan of LTO

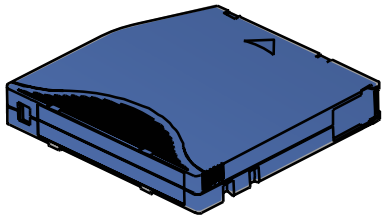


	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Native Capacity	100 GB	200 GB	400 GB	800 GB	1.6 TB	3.2 TB
Native Transfer Rate	up to 20 MB/s	up to 40 MB/s	up to 80 MB/s	up to 120 MB/s	up to 180 MB/s	up to 270 MB/s

LTO Generation 2

- ✓200 GB Native Capacity (400 GB compressed)
- ✓New Cartridge Color
- ✓35 MB/s native (70 MB/s compressed)
- ✓Ultra160 SCSI For all Models and HVD
- ✓Native Switched Fabric 2 Gb Fibre Channel Interface on (3581,3582,3583,3584)
- ✓Speed Matching
- ✓Power Management (Sleep Mode)
- ✓New IBM TotalStorage LTO Ultrium 2 Data Cartridge
- ✓Backward Read/Write with Ultrium 1 Cartridge
- ✓512 Tracks
- ✓64 MB Buffer

LTO Generation 3



- ✓400 GB Native Capacity (800 GB compressed)
- ✓New Cartridge Color Blue
- ✓80 MB/s native (160 MB/s compressed)
- ✓Ultra160 SCSI For all Models
- ✓Native Switched Fabric 2 Gb Fibre Channel Interface)
- ✓Enhanced Speed Matching
- ✓Lower Power requirements (Sleep Mode)
- ✓New IBM TotalStorage LTO Ultrium 3 Data Cartridge
- ✓Backward Read/Write with Ultrium 2 Cartridge
- ✓Backward Read Compatible with Ultrium 1
- ✓704 Tracks
- ✓128 MB Buffer

IBM LTO Generation 3 – Key Features & Enhancements over Generation 2

- **Performance**

  ✓**400 GB native physical capacity** – via greater than 37% track vs. Generation 2 via increase to 704 tracks. Greater than 33% linear density increase to 250,000 bits per inch (bpi)

  ✓**Up to 80 MB/second native data throughput** - made possible in part by a 16 read/write channels implementation. Provides the SCSI drive with u**p to 504 GB/hour (2:1compressed)**

  ✓**Low power: Ultra160 = 28W via highly integrated electronics using IBM engineered copper technology** – helps to improve reliability

  ✓**Digital Speed Matching (40, 50, 60, 70, 80MB/s) and 128 MB Data Buffer** helps the tape maintain a more consistent speed and less back hitching

- **Compatibility with existing libraries and media**

  ✓**Read/write Gen2 cartridges, read Gen1 cartridges**

  ✓**Same form factor as generation 1 & 2**

* Planned availability 2005

IBM LTO Generation 3 – Feature Enhancements over Generation 2

- **Reliability:**
  - ✓ **New independent tape loader and threader coupled with positive pin retention –** helps increase the reliability of loading & threading
  - ✓ **Improved Electronics**
    - ✓ **Improved Channel calibration feature** helps compensate for variations in recording function, media and R/W head to help optimize performance.
    - ✓ **Increased component integration** help reduce component failure; **New IBM copper-based ASICS** run cooler and help reduce power consumption.
  - ✓ **Improved Dual Stage Actuator** -- designed to provide precision head alignment for track density, improved data integrity as well as backwards compatibility with previous LTO generations
  - ✓ **Graceful dynamic brake function –** reel motors designed to gradually decelerate rather than stopping abruptly in the event of a power failure
  - ✓ **Firmware design stability - 70%+ firmware Reuse**

* Planned availability 2005

Competitive Midrange Tape Drive Specifications and IBM Gen 1, 2, 3

	IBM Ultrium 1	IBM Ultrium 2	IBM Ultrium 3	Certance CL800	HP Ultrium 2	SDLT 320	SDLT 600	S-Ait 1
Physical Capacity (native)	100 GB	200 GB	400 GB ✓	400GB	200 GB	160 GB	300 GB	500 GB ✓
Max. Transfer Rate (Native)	15 MB/s	35 MB/s	80 MB/s ✓	60 MB/s	30MB/s	16 MB/s	36MB/s	30 MB/s
Read/Write (max)	4 m/s	6.2 m/s	5.5 m/s	4.65 (calc)	5.4 m/s	3.5 m/s?		3.1 m/s
Search/Rewind (max)	6 m/s	8 m/s	8 m/s		7.25 m/s	6 m/s?		10 / 14 m/s
Load Time to BOT (max)	15 s	12 s (typ)	15 s ✓ 12 s (typ)		< 19 s	12 s	12s /40s	15 s ✓
Average access time (from BOT)	73 s	49 s 46 s (typ)	49 s ✓ 46 s (typ)	58 s	52 s	70 s	79s	70s
Maximum / avg Rewind Time	110 s	80 / 50s	88 / 55 s		104 / 52s	140 s?	140s?	40s (max) ✓
Speed Matching	No	Yes	Yes	Yes	Yes	No	Yes	No
Power Consumption (max, other)	SCSI:41W FC:47W	SCSI:29W FC:32W sleep: 50% less	SCSI:28W ✓ sleep: 9.5W+	SCSI: 42W	32W	27W	32W	25W (avg) 50W (max)
Connectivity	SCSI 1Gb FCAL	SCSI U-160 2Gb Fabric	SCSI U-160	SCSI U-160	SCSI U-160	SCSI	SCSI	SCSI U-160

✓ = Leading Positions

+ = no cartridge

Sources: IBM - functional specs. Competitors: websites, publicized data sheets

IBM LTO Ultrium

IBM TS3310

jusqu'à 49 B / 1 à 6 lecteurs IBM LTO Ultrium generation 3
30 à 122 cartouches LTO Ultrium
Lecteur Code Bar et Remote Management Unit/Specialist
Guichet de sortie 12 ou 18 cartouches
Fibre Channel 2Gb, LVD Ultra160 SCSI

IBM Ultrium Tape Autoloader 3581

jusqu'à 6.4TB
Un lecteur LTO Gen 3
80 MB/s natif
8 Cartouches
capacité native 400 GB par cartouche LTO Gen 3
LVD SCSI
ou 2 Gb Switched Fabric Fibre Channel

IBM Ultrium Library 3582

jusqu'à 19.2TB
1 ou 2 lecteurs LTO Ultrium 3 Fibre Channel 2Gb ,
LVD Ultra160 SCSI,
24 Slots pour cartouches
2 magasins amovibles de 7 cartouches en front / 1 fixe de 9 cartouches en fond
Un guichet de sortie I/O
Capacité 9.6TB native
(19.2 TB avec compression 2:1)

IBM 3584 UltraScalable Tape Library

jusqu'à 5.5 PetaBytes en LTO3
interface Media Mover SCSI-3
Performance impressionante !
Afficheur LCD Ecran Tactile
1 à 12 lecteurs par armoire
Intermix LTO Gen1-2 et Gen 3 et 3592 sur armoire spécifique
Calibration / inventaire automatique
bras à Double gripper
I/O Station de 16 ou 32 cartouches
Architecture Exclusive Multipath
Interface Web,
Et fonction Call Home

IBM Ultrium 3 Drive 3580

lecteur LTO Gen 3
80 MB/s natif
capacité native 400 GB

Note: Capacités basées sur une Compression de 2:1

IBM 3584 Enterprise Automation

- SCSI-3 Media Mover interface
  Outstanding Performance
  LCD Touch Screen display
- LTO GEN1, GEN 2 anf GEN 3 Drives can be mixed inside. Along with 3592 on a frame by frame basis
- Auto-calibrating
- Automatic inventory
  Dual gripper robotics
- Dual Power Line Cord Option
- Viewing windows
  16 or 32 Cartridge I/O Station
  Exclusive Multipath Architecture
  Web Interface, Call Home Functionality,
- Warranty 1 year on site repair Concurrent maintenance 24x7 4 Hour Response Time

1 to 12 Ultrium Drives Per Frame

IBM 3584 Enterprise Automation

3584 UltraScalable Library

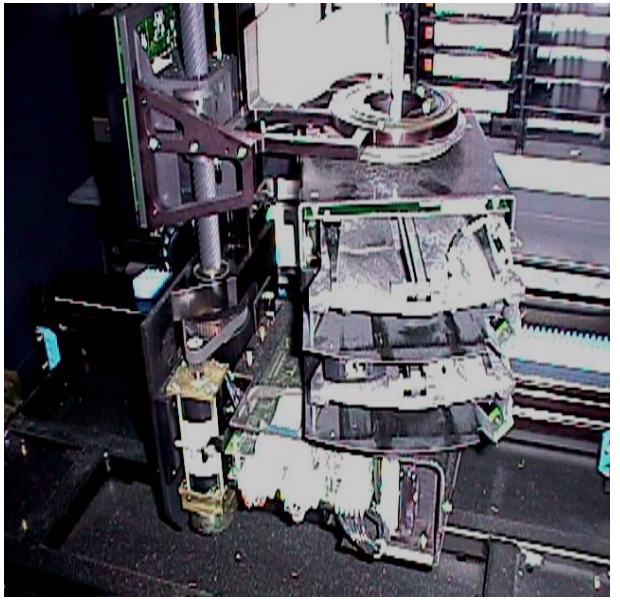
- ✓Integration of IBM TS1120 (Jaguar) Tape Drives
- ✓Worm Tape Enabled
- ✓New L22 and D22 3592 Frames
- ✓New L52 and D52 LTO
- ✓Native switched fabric 2 Gb Fibre Channel
- ✓Sixteen-frames 2.4 PB Native Storage Capacity
- ✓New 16 Cartridge IO Stations

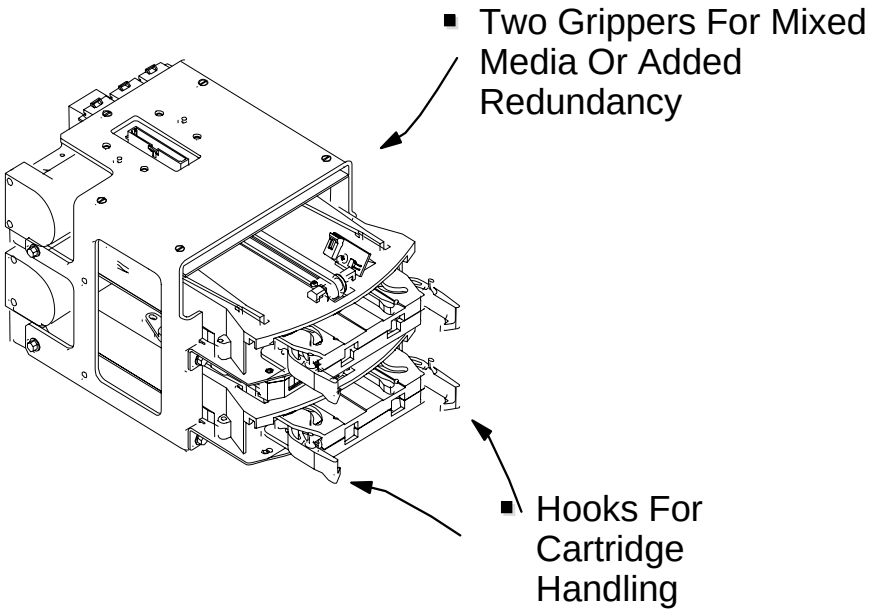
- ✓Can be configured to hold up to 192 Drives Gen 1,2,3 LTO and TS1120 Tape Drives
- ✓Drive Error Reporting Through SNMP and Call Home
- ✓Remote Drive Power Cycle
- ✓Load Balancing and Control Path failover for AIX and Linux
- ✓**Advanced Library Management System (ALMS)**

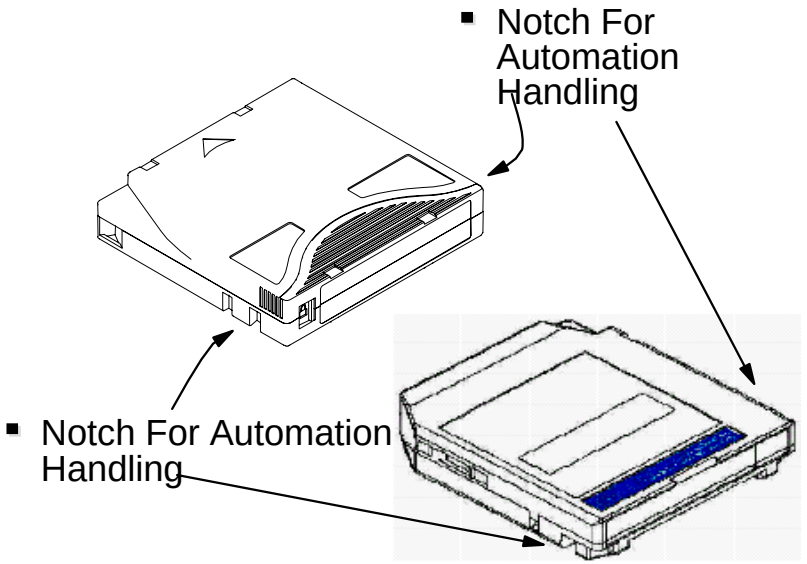
Robotic Grippers

Robotic Features

- Standard Dual Picker
  Bar-code Scanner
- Robotic Picker Accelerates at 3.8 m/s^2

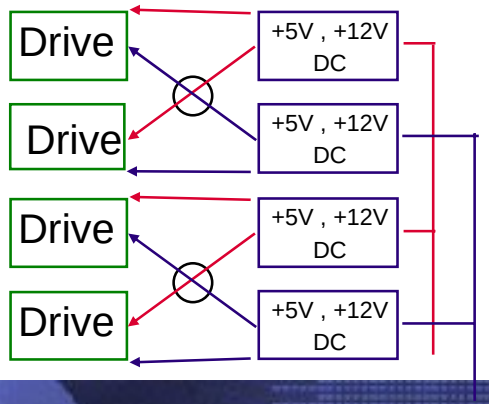


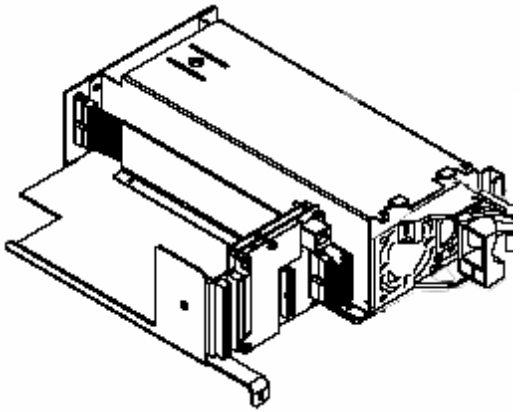




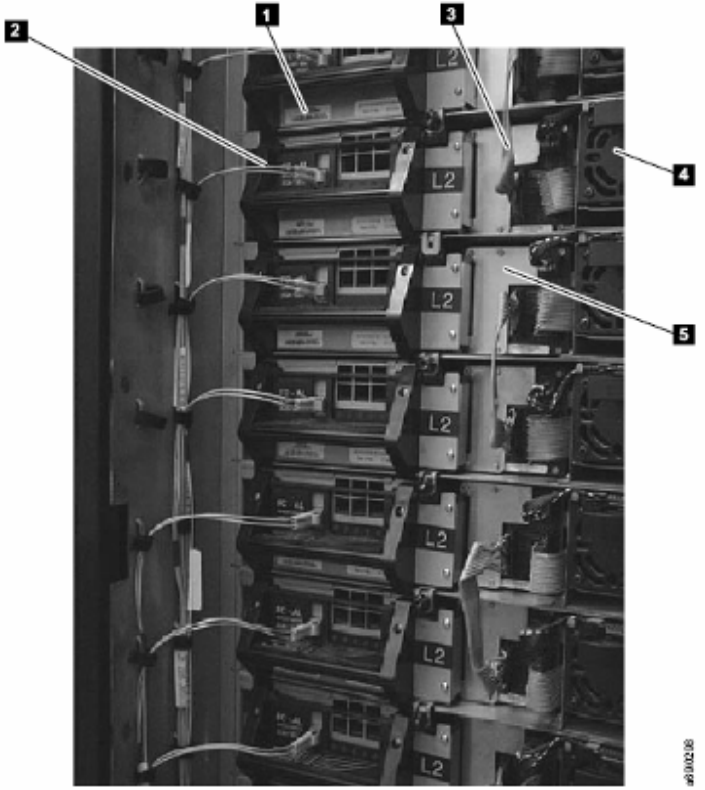
Hot Swap
Drive and Power Canisters

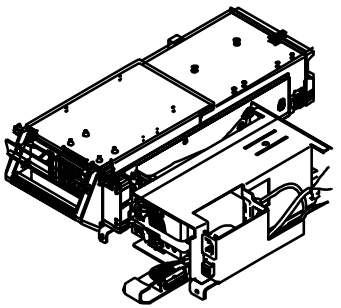
- Hot Swap Drive Maintenance
- Hot Swap Drive Power Supplies
- Cross Drive Power Redundancy
- Canister is easily accessed even while robot is in operation
- Drives and Power Supplies easily removable via Handle Ejection Process.
- GEN 2,3 Ultra3-SCSI LVD; Ultra-SCSI HVD; Native Fibre Channel (Fabric Login)



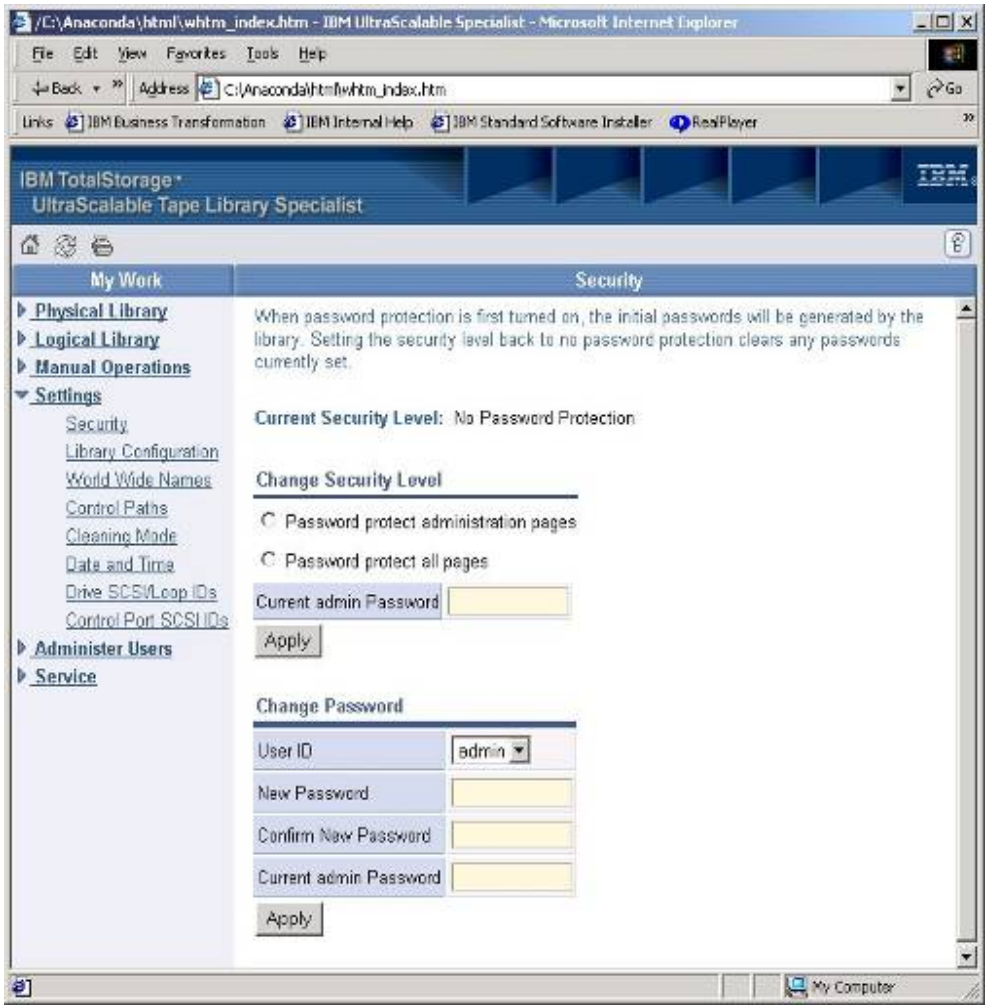


1 Drive canister
2 Fibre Channel cable connection
3 Redundant drive dc power cable
4 Drive power supply
5 Fixed tray assembly





New Enhanced Management Capabilities



- StorWatch Specialist Support for 3584 Libraries
  - Provides remote management capability, allowing operator control panel functions to be handled through the network, including microcode downloads
  - Provides SNMP monitoring capability
  - ✓Additional security options
  - ✓VolSer filter search capability (specific or wildcard)
  - ✓Administrator option to power cycle a drive canister

3584 L22/D22 and L52/D52 Competitive Overview

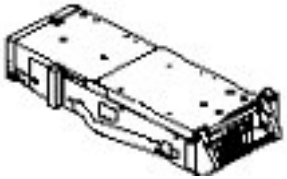
	IBM 3584 L52 / D52	IBM 3584 L22 / D22	STK L700e	STK L5500 (LTO Silo)	STK 9310 (Silo)	STK SL8500 (1 LSM)	ADIC Scalar i2000	ADIC Scalar 10K	HP Storage works ESL 712e
Maximum Configuration	16 Frames	16 Frames	Dual Frame	Single LSM	24 LSMs	32 LSMs	4 Frames	CoD*	1 Frame
Maximum Drives	192	192	40	80	1,760	64 per LSM	48	84	24
Maximum Cartridges	6,887	6,260	1,344	5,500	6,000	5,824	1,674	3,945	712
Max. Capacity (TB native)	1,377	1,878	268.80	1.1 PB	1,200	1,165	334.8	789	142
I/O Slots	16 or 32	16 or 32	20 to 40	80	21 to 80	39 or 78	96	up to 72	18,36,48 (1-3 mag)
Library Height (inch)	70.9	70.9	72	92.5	92.5	93.2	77.4	76.8	75
Min. Footprint (sq. ft per Frame)	10.2	10.2	16	89	89	51	6.46	45	10.4
Max Footprint (sq. feet)	163	163	38	89	89	5,401	25	88	10.4
Max. native TB / Sq. Foot	8	12+	7.1	12	13.5	11.1	13	9	13.7
Router-less native FC	Y	Y	Y	Y	Y	Y ?	Y	N	N
Native Dual Grippers	Y	Y	N	Y	Y	N	N	N	N
Built-in native Partitioning	Y	Y	N	N	N	N	N	N	N
Multi-Path architecture	Y	Y	N	N	N	N	N	N	N
Linear Scalability	Y	Y	Y	N	N	Y	Y	Y	N
Pass-through port	N	N	Y	N	Y	Y	N	N	N
Data-Path Failover	Y	Y	N	N	N	N	N	N	N
Load Balancing	Y	Y	N	N	N	?	N	N	N
Control-Path Failover	Y	Y	N	N	N	N	N	N	N
WWN persistence	Y	Y	Y	Y	Y	?	N	N	N
Dynamic Partitioning	Y	Y	Y-ACSLS add on	Y-ACSLS add on	Y-ACSLS add on	Y-ACSLS add on	N	N	N

Source: published datasheets and websites

*ADIC Scalar 10K also available in a max configuration of 396 drives and 13,000+ cartridges

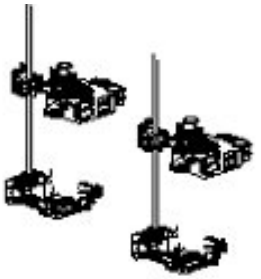
3584 2003 – 2005 Product Roadmap

•Gen 3 Integration
•Zseries/zOS Attachment



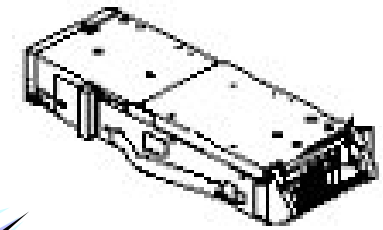
•3592 Integration
•Reduced Footprint
•Advanced Library Management System

•Dual Accessor



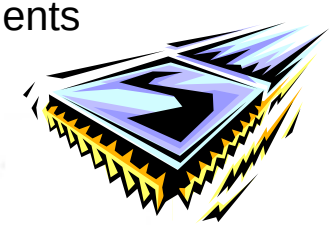
•2005

•SNMP MIB
•Other Firmware Enhancements



•16 Frames
•192 Drives
•Dual Node Power

•2004



•LTO Gen 2 Integration

•October 2003

•July 2003

•February 2003

•Availability Dates

IBM Tape Library Offerings

IBM LTO & TS1120 Offering

IBM 3584
Tape Library
LTO Gen 1(Up to 688.1TB)
LTO Gen 2 (Up to 1.36PB)
LTO Gen 3 (Up to 2.72 PB)
3592 (Up to 1.87PB)

www.ibm.com/storage/lto

Tape Re-Branding

- New Sub-Branding
  - "TotalStorage" changing to "IBM System Storage"
    - New products will be introduced under the System Storage Brand
    - Existing Products will be renamed in 2006 to adopt the System Storage Brand
  - "Virtualization Engine" is its own sub-brand (a peer of System Storage)
- "TSxxxx series" names
  - **1000 series reserved for tape drives**
    - Machine Type 3592 becomes the TS1120 Tape Drive
  - **3000 series reserved for automation**
    - Machine Type 3576 becomes the TS3310 Tape Library
  - **7000 series reserved for virtualization**
    - CVT (the subsystem) becomes the TS7510 Virtualization Engine
- When?
  - October 11th for New Products

TS1120 Tape Drives

- Small form factor drive designed for automation
- The TS1120 is an Enterprise Class tape drive that:
  - Increases performance to 100 MB/sec
  - Increases capacity to 500 GB per cartridge
  - 512 MB Buffer
  - Reduces time to first byte of data to 27 seconds
  - Reduces average search time to 11 seconds
  - Reduces rewind time to 11 seconds
- Uses a new IBM cartridge that can be initialized as a
  - 100 GB (Normal/or Worm)cartridge to provide fast access to data

  or
  - 500 GB (Normal/or Worm) cartridge to provide high capacity
- Dynamic Compression Look-Ahead
- Virtual Back hitch
- Enhanced Speed Matching
- Includes a dual-ported 4 Gbit FC / FC-AL interface
- Integrate into existing IBM 3494/3584 Tape Libraries or STK Silos

TS1120 Tape Drive Description

- Small form factor drive designed for automation
- Uses the original 3592 JA cartridge that can be initialized as a 100 GB cartridge to provide fast access to data or a 500 GB high capacity cartridge
- Includes a dual-ported 4 Gbit FC / FC-AL interface
- Provides superior locate and rewind times

Average Tape Drive Performance Metrics

	3592 60 GB	TS1120 500 GB	TS1120 100 GB	LTO gen 3
Load	20	16	16	10
Initial Search	12	37	11	46
Rewind	12	37	11	46
Unload	19	19	19	15

3592 JA/JJ Cartridge Media

- Uses a new 'dual layer' metal particle media
- Allows greater recording density and datarate
- Supports enhanced Statistical Analysis Recording System (SARS)
- Compatible with existing automation
- Available in a Standard Length, 600 Meter Cartridge
  - Can be initialized to two native capacities
    - 100 GB capacity to provide rapid access to data (JJ)
    - 500 GB to provide a high capacity solution (JA)
  - Capacity will typically range from the native capacity *
    - up to 1000 GB in Open System environments
    - up to 1500 GB in zSeries environments

* assumes 2:1 compression for open systems and 3:1 for mainframe

3592 WORM cartridge media

- Two new platinum colored WORM cartridges
  - 100 GB JR cartridge
  - 500 GB JW cartridge
- Designed to provide a non-alterable, non-rewriteable media
  - During the manufacturing process WORM flags are written to the cartridges
    - a low level encoding is written to the tape media
    - a low level encoding is written to the Cartridge Memory (CM)
  - A robust algorithm uses the low level encoding to prevent tampering
  - Semantics permit appending
    - to labeled or unlabeled files
    - new labeled or unlabeled files
  - Cartridges include a worldwide unique name to allow applications to track and validate subsequent access to records stored on the WORM cartridges

WORM Enablement

- Cartridges are designed to coexist in
  - IBM 3494 and 3584 tape libraries
  - 3592 C20 frame in a StorageTek 9310 silo
  - Standalone IBM 7014 T00 and T42 frame
- Designed for long term record retention and to meet regulatory criteria
- Operation
  - 3592 J1A Tape drive detects WORM cartridge
  - Selects WORM Operational Mode which is designed to
    - prevent overwrite or changes to existing customer data
    - supports appending new data following existing data
  - Data is read concurrently during the write operation to verify data integrity
  - Re-labeling of empty WORM cartridges is permitted