Quantum

Backup Basics
Choosing the best backup process

Backup. Recovery. Archive. It's What We Do.

Are You Responsible For Making Sure That The Information On Your Company's Computers Is Safe and Secure? Then, This Booklet Is For You!
Data is often the most important non-human asset that a company has. If critical data is lost or becomes unavailable, it can hinder your business.

To protect data, some businesses manually copy files to external disks, floppies or CDs, which is time consuming, disruptive to day-to-day operations and error-prone. This booklet explores:

• The business case for backup
• What can happen to your data
• How you can protect your data
• Technology hardware options
• Software options

This common-sense guide will assist you in selecting products that fit your needs. It also explains the tools you will need to automatically and reliably keep your data safe.

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Data Storage vs. Data Backup

Data storage and backup, while related, are not the same thing. Data storage is the information that is stored on your computer -– the e-mail you sent to your boss, the payroll files in finance, and the bills that had been sent to clients for payment. Backup is the act of deliberately copying this data and storing it where it is both safe and easily retrievable.

Why backup on tape?

Tape is less expensive and one of the most portable media for high capacity needs. Review the chart below for media comparisons.

Media Type	How Much Will It Hold? (Capacity In GB)	How Many GB Of Data Is Copied Per Hour?	How Many GB Are Copied During 8 Hour Backup Window?	Cost Per Unit	Cost Per GB
CD-RW	0.65	0.009936	0.08	$1.00	$1.54
DVD-RW	4.7	0.05832	0.47	$1.50	$0.32
DDS-4	20	10.8	86.40	$7.50	$0.38
DAT72	36	10.8	86.40	$20.00	$0.56
ZIP	0.75	26.28	210.24	$10.00	$13.33
AIT-4	200	86.4	691.20	$68.00	$0.34
S-AIT	500	108	864.00	$230.00	$0.46
DLT IV	40	21.6	172.80	$35.00	$0.88
DLT VS1	80	28.8	230.40	$50.00	$0.63
Super DLT I	160	57.6	460.80	$55.00	$0.34
Super DLT II	300	129.6	1036.80	$105.00	$0.35
LTO-2 HH	200	72	576.00	$56.00	$0.28
LTO-2	200	122.4	979.20	$56.00	$0.28
LTO-3	400	244.8	1958.40	$120.00	$0.30

HINT BOX

Tape is best for reliable backup at the lowest cost.

HINT BOX

The average tape drive holds approximately 200GB of data.

Essential Elements Of A Basic Backup System

Every backup system has six key elements:

Data

Digital information, i.e., the stuff on your hard drives, CD-ROMs, Zip™ disks, etc.

Hardware device to backup data

Backup is simply copying data from one device to another with the intention of protecting it against loss or damage. You can back up to hard drives, CD-Rs, CD-RWs, Zip and Jazz™ disks, external hard drives, optical disks and tape devices.

Software

These applications automate the collection, tracking, and writing of data to a backup device, as well as the restoration of data from the backup device to its place of origin.

Your Backup Process

Scheduling backup procedures in a way that adequately protects data while minimizing the impact of backup operations on networks is critical. Properly established, your internal backup process can liberate your company from the timewasting chore of babysitting backups. (i.e. most backup processes can take place at night, unattended).

Off-Site Location

Storing backup tapes in the same facility where they are created exposes them to the same risk as the original data. By rotating backup tapes to a separate location, you can easily restore data if loss or disaster strikes.

Media

It is important to have the correct number of media cartridges on hand to support the backup device and backup methodology you select. A solid media management plan promotes increased reliability and ensures media longevity. Refer to the Media Type associated with your drive on pages 3 and 4.

A Primer On Tape Drive Technologies

Magnetic digital tape is a reliable, field-proven medium for data storage. There are several tape drive technologies that are commonly used today. While all will do an adequate job of getting your data from your servers to a tape cartridge, there are differences between them and advantages you should be aware of.

DLT™

Drive Brand	Approximate Drive Price	Native Capacity (GB)	Native Speed (GB/Hr)	Media Type
DLT VS80	$799	40	10.8	DLTtape IV
DLT VS160	$949	80	28.8	DLTtape VS1
DLT-V4	$999	160	36	DLTtape VS1
SDLT 320	$3,299	160	57.6	Super DLTtape I
SDLT 600	$4,049	300	129.6	Super DLTtape II

DLT is a very robust technology that offers reliability, capacity and performance at an exceptional value. Over 100 million DLT cartridges and two million tape drives have been sold. DLT offers many options with different price/performance characteristics. Mean Time Between Failure (MTBF) for DLT drives is an incredible 250,000 hours of MTBF.

LTO™

Drive Brand	Approximate Drive Price	Native Capacity (GB)	Native Speed (GB/Hr)	Media Type
LTO-2	$2,849	200	122.4	LTO-2
LTO-2 HH	$1,949	200	72	LTO-2
LTO-3	$4,299	400	244.8	LTO-3

Linear Tape Open, also known as LTO, is known for its high performance at higher capacities. LTO drives are an excellent choice for large capacity needs with small backup windows. LTO maintains exceptional reliability tested to 250,000 hours of MTBF.

DAT™/DDS

Drive Brand	Approximate Drive Price	Native Capacity (GB)	Native Speed (GB/Hr)	Media Type
DDS-4	$499	20	9.9	DDS-4
DAT72	$749	36	12.6	DAT-72

Digital Audio Tape, also known as DAT or DDS technology, is another popular choice for backup systems. Based on a 4mm tape, DAT provides a low-cost alternative to other formats. For lower capacity needs with longer backup windows, DAT provides an excellent total cost of ownership due to the inexpensive media and device costs.

Travan ™

Drive Brand	Approximate Drive Price	Native Capacity (GB)	Native Speed (GB/Hr)	Media Type
Travan 20	$225	10	3.6	Travan 20
Travan 40	$359	20	7.2	Travan 40

Travan technology is an affordable backup solution for small servers, desktops, Small office/Home (SOHO) office environments with longer backup windows.

* Tape drives and autoloaders can "compress" data to achieve larger amounts of storage. "Native" capacities and speeds occur without this compression. Data compression rates vary by data type.

Backup Software: The Brains Behind The Hardware

Backup software collects data from various sources, such as PCs and servers, and writes a copy of that data to the media in a backup device, such as a tape drive or autoloader. Most companies that utilize an automatic backup process employ two types of backup: full and incremental. Full backups, which copy and store all available data, are usually performed on weekends, since much more data needs to be collected. For an incremental backup, the software detects and collects only data that has changed since the previous incremental backup. Typically, incremental backups are performed nightly so the data transfer does not impact users on the network.

There are a number of good backup software options available, from the Windows® operating system to complete packages for business-critical data. A few backup devices come bundled with the software you need to backup a server on-site; giving you a complete backup solution in a single package. Quantum, for instance, ships Backup-Ready products and includes a copy of Symantec's Backup Exec™ QuickStart with standalone drives and autoloaders. Travan solutions come with Yosemite TapeWare™ XE backup software.

Software packages from Independent Software Vendors (ISVs), such as those listed above, are probably the most popular choice for backup. These products are highly specialized and are often optimized to work with your specific drive or autoloader. ISVs and tape manufacturers even offer certifications that ensure the software and tape drive or autoloader will work together flawlessly. Their powerful features, flexibility and simplified management tools easily justify their cost.

What to look for in backup software:

- Calendar-based scheduling to customize backup strategies at the click of a mouse
- Easy wizards to configure, backup and restore your files and applications
- Ability to backup and restore multiple servers and operating systems from a single console
- Rotation schemes to easily manage daily, weekly and monthly backup jobs
- Easy-to-install with the ability to start conducting backups out-of-the-box

Leading ISVs in the backup market include:

- Symantec Backup Exec™ and NetBackup product
- Computer Associates (CA) with BrightStor ARCserve®
- EMC Software with Legato Networker and Dantz Retrospect

Selecting Your Hardware
Single Tape Drive or Automation Solution?

Most small or mid-sized business environments will choose either an autoloader solution or a single tape drive attached to a server. The largest businesses backing up massive amounts of data rely on tape libraries with multiple drives and cartridges, but that's another issue not addressed here. (for more information on tape library solutions visit www.quantum.com).

Whether a single tape drive or autoloader solution is best for your business depends on a number of factors, including your capacity needs and resources. An interactive Tape Product Advisor is available online at http://www.quantum.com/Products/TapeDrives/Index.aspx.

Here is the main difference between autoloaders and standalone tape drives:

Autoloaders	Standalone drives
Automates much of the backup process across multiple drive cartridges – eliminating the risks of human error. Human intervention is only necessary when inserting and removing tapes outside of the autoloader, such as for off-site storage purposes.	A single drive attached to your server is a simple, cost-effective drive ideal for less data-intensive environments –– can easily be upgraded to an autoloader solution as needs change.

What's An Autoloader?

The term "autoloader" refers to a backup device that contains a tape drive, tape cartridge slots and a mechanism for moving tapes between the slots and the tape drive. Autoloaders are controlled by backup software, enabling specific backup routines to run automatically while simplifying restoration of data.

Typical Autoloader Components

Picker moves tape between magazines and drives. Bar code scanner is optional.
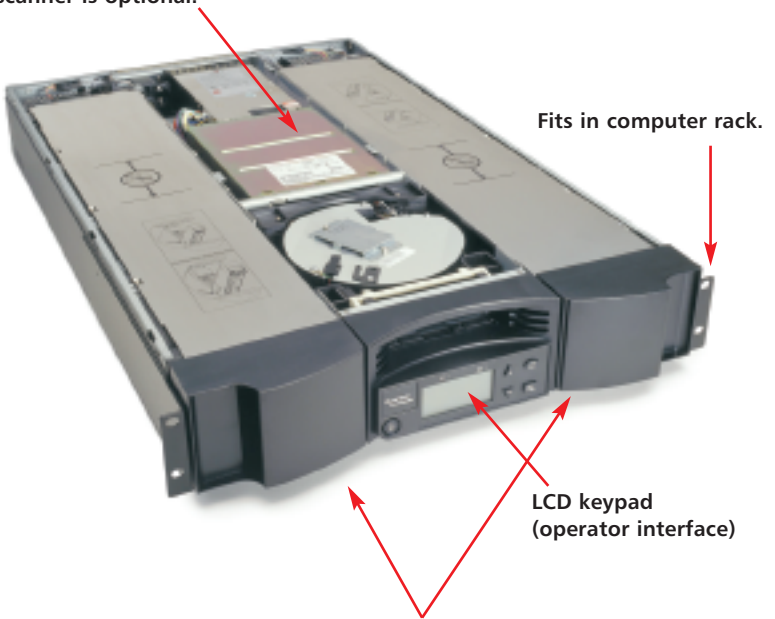
Fits in computer rack.

LCD keypad (operator interface)

Removable cartridge magazines with a minimum of 8-cartridge slots recommended.

Before You Go Shopping For A Backup Device, Ask:

1. What is your backup window – when and how long will it take you to do your backup?

Since the backup process is touching the data while it is making a copy, it is recommended to back up your data after work has stopped for the day and your employees have gone home. If you are like most companies, you can start your backup at 8pm. If you want it to finish by 6am the next morning, you have a 10-hour backup window.

2. How much data do you need to backup?

You will only need to back up your data, not all of the other things on your computer. Most computer operators know how to look at how much data is on the hard drives of your systems. You will only need to backup the data that has changed each day. There is no need to back up data that has not changed when you already have a copy of it in your full backup. This is called an incremental backup.

3. How fast is your data growing?

While backing up the data that has changed today will determine how much total storage you need now, estimating how much your data will grow will show you what you will need a year from now. A good rule of thumb is that the amount of data in a company doubles every 18 months.

4. How often do you want to physically move tapes off-site?

Remember that you will need to use the tapes you have off-site in a worst-case scenario where all of your computer data is lost. If you move tapes off-site every week your data would be at most one week old.

HINT BOX

A good rule of thumb is that the amount of data in a company doubles every 18 months.

HINT BOX

You have many choices for hardware and your selection should be based upon your tolerated level of risk, amount of data and the backup window.

Product Reference
Choosing a tape drive

Single Tape Drives Available Based on Capacity Needs

Total Data Requiring Backup	Optimal Tape Technologies Meeting Capacity Requirements*
40GB or less	DLT VS80, DLT VS160, DLT-V4, DDS-4, DAT 72, Travan 20, Travan 40
80GB or less	DLT VS80, DLT VS160, DLT-V4, SDLT 320
160GB or less	DLT-V4, SDLT 320, SDLT 600, LTO-2, LTO-3
350GB or less	DLT-V4, SDLT 320, SDLT 600, LTO-2, LTO-3
600GB or less	SDLT 600, LTO-3

*Estimates are based on two tape cartridges with uncompressed (native) data capacity.

Choosing an autoloader

Selecting an autoloader is fairly straightforward. Answer the questions on (page 8) to determine your needs, and review the chart below to view the technologies that meet your needs with a seven-cartridge autoloader.

(A worksheet has been provided at the back of this booklet for your convenience):

Autoloader solutions available based on capacity needs

Total Data Requiring Backup	Optimal Tape Technologies Meeting Capacity Requirements*
140GB or less	DLT VS80, DLT VS160, DLT-V4, SDLT 320, LTO-1, LTO-2, DAT 72
450GB or less	DLT VS160, DLT-V4, SDLT 320, SDLT 600, LTO-1, LTO-2, LTO-3,
700GB or less	DLT-V4, SDLT 320, SDLT 600, LTO-2, LTO-3
1.2TB or less	DLT-V4, SDLT 320, SDLT 600, LTO-2, LTO-3
2.1TB or less	SDLT 600, LTO-3

*Estimates are based on seven-cartridge autoloaders with (native) data capacity.

So… How Do I Install My Tape Drive?

Quantum provides lots of information to help you install your tape drive. Typically, the simple "Getting Started" guide, included with your purchase, will be enough to guide you to connect and configure your tape drive. Most installations only require connection of the data cable and power cable (included with Quantum tape drives and autoloaders), installation of any software you want to use can add much in capabilities above that of the native operating system backup utilities.

So…How Do I Install My Autoloader?

When you purchase an autoloader, you will receive full installation instructions or some type of "Getting Started" guide included in the box contents. Typically, installation guides are simple one-page documents that contain graphically detailed instructions in easy 1-2-3 order. Special skills or knowledge of computers is not absolutely necessary, but it may help.

Steps you can expect:

1. Connecting the autoloader to a server: If your server doesn't have one, you may need to install a SCSI host bus adapter (HBA) to connect the cable from the autoloader. Contact your computer professional for assistance.
2. Installing software: At a minimum, this means the driver for the autoloader. You may also install backup software from an ISV.
3. Powering up: Plug it in and turn it on. There may be a simple configuration routine to perform with the user interface (screen and buttons) on the front of the unit.
4. Rackmounting your autoloader: This one's optional. But should you choose to mount your autoloader in a rack enclosure, you'll need a rackmounting kit (standard with Quantum's SuperLoader™ 3). A standard 19-inch rack is easy to install, and is similar to a stereo rack and can be purchased through your reseller. This might be handy if you want to put your backup system in the same rack as your servers.

HINT BOX

Many people are not comfortable installing and configuring unfamiliar hardware and software. Make sure the manufacturer or reseller you purchase from offers installation services and adequate support.

Up And Running. So Now What?

Setting proper backup procedures is critical to maximizing the value of your automated backup solution. Most backup software from ISVs will contain recommended procedures based on your needs. However there are a few simple guidelines, as mentioned earlier in this guide.

How often?

Most companies find that a daily incremental backup, with a full backup on the weekend provides the right balance between data protection and impact on network systems.

How do I know if it worked?

ISV backup software provides a "verify" function. It takes a little longer for the software to check the data on each tape, but you'll know it's there when you need it.

Disaster recovery strategies

All companies – of all sizes - need to store their backed up data off-site. That way, if there's an earthquake, flood, power outage, fire, theft or other disaster, tapes from the remote location can be returned to restore downed systems. Otherwise, anything bad that happens to your PCs and servers will most likely happen to your tape drive or autoloader if housed in the same facility.

Backup for your backup process

Make sure that a second person is trained in the backup process in case the primary person is out of the office. It is also a good idea to occasionally check the tapes to verify that the data is being backed up properly. It is also recommended to have the procedure in writing and on-hand.

HINT BOX

Planning your backup process is the most important step in protecting your data.

Backup In The Real World

Here are two examples of how backup (or a lack of it) can affect a business in the real world.

I. The books get cooked:

The hot pastrami was to die for. That's why every Friday, Keith, his partner and their assistant would head down to the other end of the strip mall where their office is located to their favorite Deli for lunch. At least they used to, until the Deli caught fire one evening, taking out most of the mall with it - including Keith's real estate office.

Keith was relieved that no one was hurt in the fire, but standing in the dripping mess the next day, all he could think about was the customer data, property photos, financials and other information that went up in smoke along with his PCs and potted plants. All they had was a small file and print network with one small server. And with just three people in the office, that's really all they needed. It wasn't a lot of information compared to larger enterprises, but it was critical information – and would take weeks or months – plus lots of customer goodwill – to replace. Keith never really thought about the possibility of losing his data – or the havoc it would wreak.

II. Designing disaster:

Faxes continued to pour in. The phones kept ringing. And the light switches still made the office either light or dark. Dark was just fine with Jane. The graphic design business she built from the ground up was gone.

The previous night, burglars stole the company's four PCs, six Macintosh® computers and its file server. Some of Jane's older projects were on CDs and Zip® disks. And she had hard copies of previous years' accounting and payroll data. But all her current projects, billing information, e-mail, and client and employee information were simply gone.

Sure, her insurance would replace the computers. It would even cover the expensive software that was central to her business. But insurance doesn't replace the information that was on the computers. Jane and her employees never felt they had the time to copy huge graphics files to CD or tape for safekeeping. And it never even occurred to them to back up something as common as e-mail. Though she relied on technology to drive her business, Jane felt that a formal business backup process and backup automation products were too expensive, too "techy," overkill.

This Is A Tape Story. So Let's Rewind.

Backup products like tape drives and autoloaders help ensure happy endings to stories of near-tragedy. So let's visit Jane and Keith again. This time, a month before the burglary and fire, having read this booklet, Jane and Keith call their local resellers. They discuss their requirements and preferences (see chart on page 9) with a salesperson. Because of the large size of the graphics files produced at her firm each day, Jane orders an autoloader and tape backup software. For Keith, with less data and a tighter budget, a standalone tape drive is just the right fit.

Installation was as easy as 1-2-3. Jane schedules daily incremental backups with a full backup running during the weekend. Each Monday, she takes the tape home that contains the full backup. This, she has decided, is adequate disaster protection for her company. At Keith's office, his assistant runs daily incremental backups (changed data only), sending a copy of the day's data home with Keith to be put in his fireproof lockbox. On Friday, the assistant runs a full backup.

So now, when disaster strikes, panic does not arise. Insurance claims are filed, equipment is replaced and, most notably, neither Keith's nor Jane's business fails. After pulling the appropriate backup tape cartridges from their respective off-site safes, Keith and Jane start to rebuild their systems, including applications, client projects, contact databases and e-mail. Jane, Keith and their employees settle in and pick up where they left off.

For Jane, even if the burglars never struck, an automated tape backup system would have streamlined her business' day-to-day operations by safely and routinely backing up data without human intervention, thus protecting them from losing any design files or business data during every normal business day. That way, even common but troublesome events, such as a hard drive failure, corruption from a virus, mistakenly deleted files, or even fire and natural disasters can be managed. Tape technology that supports WORM (Write Once, Read Many) technology, such as Quantum's SDLT 600 tape drive provide secure, quick and easy retrieval of archived records, powerful management tools and software support.

Example Summary	Jane	Keith
Backup Window	10 hours	12 hours
Amount of Data	300GB	120GB
Amount of Storage Required	750GB	250GB
Rate Data is Growing	50% a year	110% a year
Total Data in 1 Year	450GB	130GB
Move Tapes Off-site	Weekly	Daily

HINT BOX

Tape drives that support WORM technology provide secure, quick and easy retrieval of archived records.

Shopping For My Backup Device

Quantum Authorized Online Partners

CDW
www.cdw.com
888-239-7313

Insight
www.insight.com
800-467-4448

PC Connection
www.pcconnection.com
888-213-1237

PC Mall
www.pcmall.com
800-555-MALL

Tech Depot
www.techdepot.com
800-721-8344

Zones
www.zones.com
800-408-9663

Government Enterprise Storage Providers (ESP-Gs)

CDW•G
www.cdwg.com
800-581-4239

DLT Solutions, Inc.
www.dlt.com
800-262-4358

GovConnection
www.govconnection.com
800-998-0009

Independent Software Vendors

Computer Associates (CA)
www.computerassociates.com
800-225-5224

Symantec
www.symantec.com
800-327-2232

EMC
www.emc.com
650-210-7000

Where To Turn If You Have More Questions

While "Backup Basics" is intended to answer many of the questions faced by businesses with backup challenges, but your best source for help is a knowledgeable storage professional. Personalized help can be found at Quantum Corporation. Quantum manufactures a full portfolio of standalone drives and autoloaders based on DLT, LTO, DAT/DDS and Travan technology and is a useful resource for more detailed storage information.

Please call toll free 1-800-677-6268
You can also visit Quantum online at www.quantum.com

Worksheet

Determining Your Backup Window:

1. What time does your office close or most employees are no longer on the network:

2. What time does your office open and employees are on the network:

Calculate the number of hours between close and open
(This is your backup window):

Backup Window Example Calculation:
Office closes at 7 PM, office opens at 7 AM – You have a 12-hour backup window

Determining the Amount of Data You Need To Back Up

1. Office Computers – Determine how much data is on each computer. Look under "My Computer/My Document" and review "local drive: c". Under "Capacity", look for the "USED" category on each computer (typically in GB) and add them up for a total number:

2. Servers – Determine how much data is on each server. Same steps as above:

3. Other Equipment – Some companies utilize NAS devices (Network Attached Storage). Calculate the amount of data on your additional storage devices:

Add up the numbers in boxes 1, 2 and 3 above for your
Total Amount of Data:

Determining Your Data Growth Rate

1. To determine your average rate of growth, capture the "Total Amount of Data" at one specific point in the month, and then calculate it again one month later. Utilize this monthly growth rate to estimate your company's annual growth rate:

Example: May 1 - 300GB of data
                  June 1 – 315GB of data
                  Rate of growth: 5% a month

Once you have all this calculated, review the charts on page 10 to
determine the right backup solution for you.

Glossary

Autoloader: a data storage device containing one tape drive, tape cartridge slots and a mechanical device that automatically loads and removes tapes from the drive(s), usually used for backup/restore.

Automation: the techniques and equipment used to achieve automatic operation or control, i.e., replacing human activity with a mechanical solution.

Backup: the act of deliberately collecting data, creating a viable copy of it, and storing it where it is both safe and easily retrieved.

Backup process: the guidelines or schedules by which backup operations occur.

Backup software: an application that specifically aids in automating the collection and writing of data to a backup device, as well as the restoral of data from the backup device to its place of origin.

Backup window: the time during which a backup is scheduled to take place, usually during non-working or off-peak hours when impact to network users will be minimal.

Capacity: the measure of data that can be stored on a device.

Compression (compressed): encoding data to take up less storage space on magnetic tape. Compression is carried out in the host (software compression) or in the drive itself (hardware compression). Software compression speed is dependent on host processor power, whereas hardware compression gives optimum performance and is transparent to the user. Data transfer speed and total tape capacity are affected by the data compression achieved.

Data: digital information

Data protection: the act of reducing risk to data loss or corruption.

DAT/DDS (Digital Audio Tape): A magnetic tape technology for backing up data using helical scan recording. DAT uses 4mm cartridges that look like small audiocassettes and conform to the DDS (Digital Data Storage) standard. With native capacity points from 24-432GB, DAT or DDS is popular in the workstation, PC and small server environments.

Disaster recovery: a plan by which backed-up data can be restored after a catastrophic event.

DLT: a linear tape technology designed specifically to store for backup/restore and archival applications.

Full backup: a backup operation that copies all available data from network-attached sources (servers, PCs, drives and drive arrays).

GB: gigabyte; a unit of computer memory or data storage capacity equal to one billion bytes.

Host Bus Adaptor (HBA): a hardware device used for the interface between a server and network or other device (such as an autoloader).

Incremental backup: a backup operation that detects and collects only data that has been created or changed since the previous backup.

Independent Software Vendor (ISV): software vendors who create products that can be used with hardware devices from various manufacturers. (i.e. CA, Legato, VERITAS)

LTO: Linear Tape Open™: a linear tape technology similar to DLT, designed for data storage applications such as backup/restore and archive.

Magazine: removable container for holding multiple cartridges - often holds between 6 and 8 cartridges for easy transportability or offsite storage.

Mail Slot: opening in the autoloader where tape cartridges can be removed and inserted into the autoloader without turning it off or interrupting operation.

Mean Time Between Failure (MTBF): a reliability measurement expressing the expected life of a device before service or replacement is required.

Off-site: a term used to describe the removal of backup tapes from the premises where they were created to provide a geographical safeguard against loss or damage.

Picker: robotic mechanism for capturing a tape and moving it within the autoloader.

Restore, restoration: to replace lost or damaged data with a copy found on a backup tape or tapes.

SCSI: Small Computer System Interface; used for connecting peripheral devices, such as autoloaders, to computers or servers.

Standalone tape drive: a single tape drive that is not part of an automated solution.

Storage: a place where data resides; example: server or computer hard drive, CD-ROM, floppy disks, tape.

Tape drive: the device that writes and reads data to and from a tape.

Tape cartridge: the container housing tape, spindle(s), and sometimes-embedded computer chips, such as with recent AIT.

Transfer rate (data transfer rate): a measurement of tape drive performance that quantifies how quickly data can be read or written by a tape drive.

Travan Tape technology: based on linear recording, with native capacity points from 10-20GB, represents an efficient cartridge and drive design that reduces tape stress, ensures data integrity and increases drive and cartridge reliability. Travan mechanisms are known to be very reliable at a cost-effective price point and are the perfect choice for PCs, workstations and entry-level server environments.

Verify: an operation performed by backup software the ensures a viable copy of specified data has been recorded by the backup device (such as an autoloader).

Quantum®