

Tape Drive

DIT-V4

DLT-V4 Product Specification, 81-81349-02 A01, November 2005, Made in USA.

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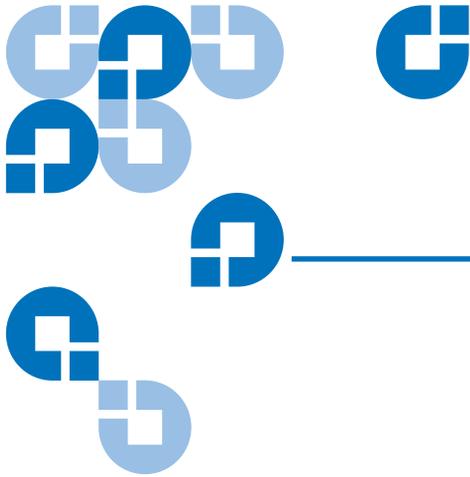
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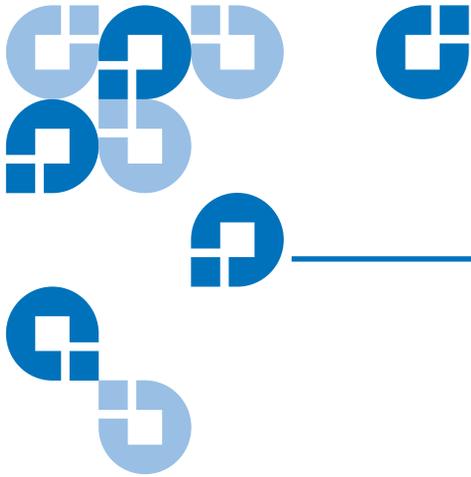
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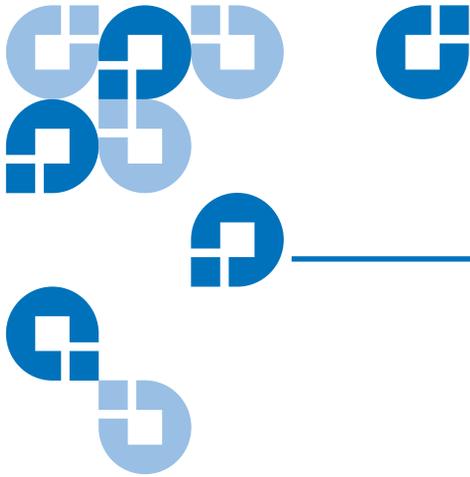
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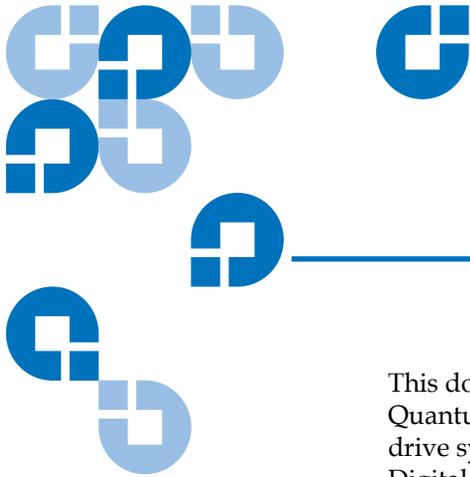
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Preface

This document serves as an easy-to-use information source to familiarize Quantum customers and systems professionals with the DLT-V4 tape drive system. The DLT-V4 tape drive is an extension of Quantum's Digital Linear Tape (DLT[®]) product family.

This chapter describes the purpose, scope, and audience of this document. It also lists the typographical conventions used in this document.

Purpose

This document describes the tape drive, listing its physical, functional, and performance specifications, and describing the standards that the tape drive meets.

Audience

The primary audience for this document consists of engineers and technicians interested in integrating the tape drive into tape libraries and other equipment.

Document Organization

This document is organized as follows:

- [Chapter 1, Physical Specifications](#), contains the physical description of the DLT-V4 tape drive, including the internal and tabletop tape drives, and the environmental temperature and humidity specifications.
- [Chapter 2, Functional Specifications](#), contains the functional specifications of the DLT-V4 tape drive, including the LED functions.

- [Chapter 3, Performance Specifications](#), describes the performance specifications of the DLT-V4 tape drive, including timing characteristics, data cartridge and media characteristics, and the reliability factors of the tape drive.
- [Chapter 4, Power Specifications](#), describes the power specifications of the DLT-V4 tape drive.
- [Chapter 5, Environmental Specifications](#), describes the environmental specifications of the DLT-V4 tape drive.
- [Chapter 6, Shock and Vibration Specifications](#), describes the shock and vibration specifications of the DLT-V4 tape drive. All testing was done on both the internal and tabletop tape drives.
- [Chapter 7, Emission and Immunity Specifications](#), describes the emission and immunity specifications of the DLT-V4 tape drive.
- [Chapter 8, Safety Specifications](#), describes the safety specifications of the DLT-V4 tape drive.
- [Appendix A, Regulatory Statements](#), provides the regulatory statements of the DLT-V4 tape drive.

Notational Conventions

This document uses the following conventions:

Note: Notes emphasize important information related to the main topic.

Caution: Cautions indicate potential hazards to equipment and are included to prevent damage to equipment.

Warning: Warnings indicate potential hazards to personal safety and are included to prevent injury.

This document uses the following:

- Tape Drive System – Refers to the complete system including the cartridge.
- Tape Drive – Refers to just the tape drive and does not include the cartridge.
- Right side of the tape drive – Refers to the right side as you face the component being described.

- Left side of the tape drive – Refers to the left side as you face the component being described.
- *b* – All binary numbers are succeeded by “b.”
- *h* – All hexadecimal numbers are succeeded by “h.”
- Error or attention conditions are represented in parenthesis that translate as follows:

(SK=S ASC=AA ASCQ=QQ)

where:

S – hexadecimal sense key value

AA – hexadecimal additional sense code

QQ – hexadecimal additional sense code qualifier

Typographical Conventions

This document uses the following typographical conventions:

Element	Convention	Example
Commands	Uppercase (unless case-sensitive)	FORMAT UNIT
Messages	Uppercase	INVALID PRODUCT NUMBER
Hexadecimal Notation	Number followed by lowercase h	25h
Binary Notation	Number followed by lowercase b	101b
Decimal Notation	Number without suffix	512
Acronyms	Uppercase	POST
Abbreviations	Lowercase, except where standard usage requires uppercase	Mb (megabits) MB (megabytes)
Dimensions in Figures	No units specified (Inches understood unless otherwise specified)	0.57 EJECT DISTANCE

Related Documents

The following documents are related to the DLT-V4 tape drive:

Document No.	Document Title	Document Description
81-81252-xx	Bezel Replacement Guide	Provides bezel replacement instructions
81-81422-xx	DLT-V4 Product Manual	Provides detailed product information for the tape drive.
81-81355-xx	DLT-V4 Quick Start Guide	Provides basic tape drive installation instructions.

Current SCSI standards documents available from www.t10.org

- SCSI Architecture Model (SAM-3)
- SCSI Primary Commands (SPC-3)
- SCSI Parallel Interface (SPI-5)
- SCSI Stream Commands (SSC-3)

Current SATA standards documents available from www.serialata.org

- Serial ATA 1.0a Specification

SCSI Standards

Copies of the approved version of the SCSI standards may be obtained from:

Global Engineering Documents
 15 Inverness Way, East
 Englewood, CO 80112
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Contacts

Quantum company contacts are listed below.

Quantum Corporate Headquarters

To order documentation on this or other Quantum products, contact:

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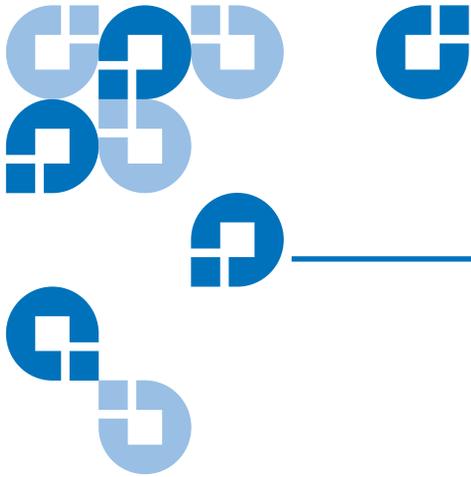
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Physical Specifications

This chapter contains the physical description of the DLT-V4 tape drive, including the internal and tabletop tape drives, and the environmental temperature and humidity specifications.

Physical Description

Physical Dimensions and Weights

Table 1 Physical Dimensions

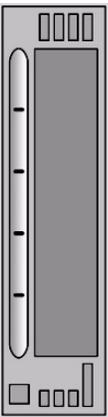
Specification	Internal Tape Drive	Tabletop Tape Drive
Height	1.656 in. (42.05 mm) with the bezel 1.618 in. (41.10 mm) without the bezel	2.608 in. (66.24 mm)
Width	5.748 in. (146.00 mm) behind the bezel 5.807 in. (147.50 mm) with the bezel	8.352 in. (212.13 mm)
Length	8.614 in. (218.80 mm) measured from the rear of the front bezel 8.874 in. (225.40 mm) including the bezel	10.728 in. (272.49 mm)

Table 2 Weight Specifications

Specification	Internal Tape Drive	Tabletop Tape Drive
Unit Weight	3.00 lb. (1.36 kg)	8.00 lb. (3.63 kg)
Shipping Weight	4.39 lb. (1.99 kg) depending on the configuration	11.81 lb. (5.36 kg) depending on the configuration

[Table 3](#) shows the acceptable operating orientation for the DLT-V4 tape drive.

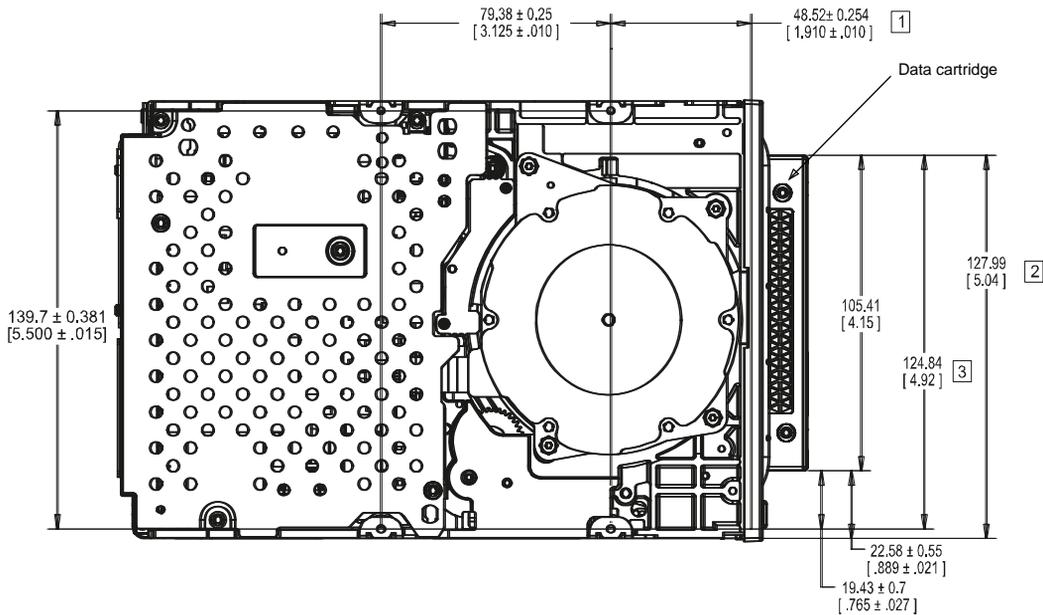
Table 3 Proper and Acceptable DLT-V4 Tape Drive Orientation

Orientation	Internal Tape Drive	Tabletop Tape Drive
Top Side Up (typical)		
Left Side Down		
Right Side Down		

Internal Tape Drive Mounting Hole Dimensions

[Figure 1](#) shows the mounting holes and dimensions in a bottom view for the internal tape drive.

Figure 1 Internal Tape Drive
Mounting Hole Dimensions
(Bottom View)

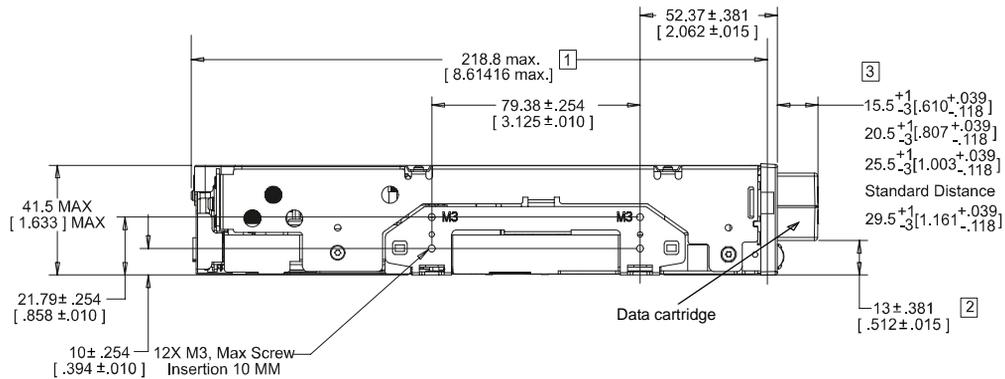


Notes: The following is additional information for [figure 1](#).

- The dimension referenced in boxed note [1] is from the front of the base plate.
- The dimension referenced in boxed note [2] is from the right-side tape drive mounting plane to the interior guiding surface of the media opening.
- The dimension referenced in boxed note [3] is from the bottom tape drive mounting hole to the interior guiding surface of the media opening.
- The tape drive width and length are standard 5¼-inch form factor measurements.
- Dimensions are identical on left side and right sides.
- Dimensions are in millimeters. The dimensions in brackets [x.x] are in inches.

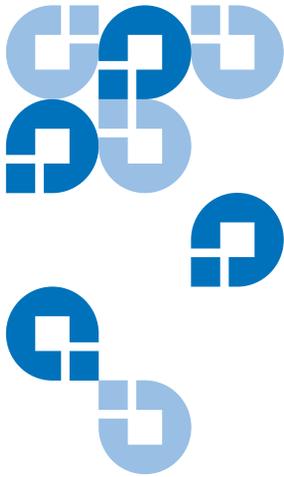
[Figure 2](#) shows the mounting holes and dimensions in a side view for the internal tape drive.

Figure 2 Mounting Hole Dimensions (Side View)



Notes: The following is additional information for [figure 2](#).

- The dimension referenced in boxed note [1] is from the front of the base plate.
- The dimension referenced in boxed note [2] is from the bottom tape drive mounting plane to the interior guiding surface of the media opening.
- Boxed note [3] states that the data cartridge is shown in the ejected position.
- The tape drive width and length are standard 5¼-inch form factor measurements.
- Dimensions are identical on left side and right sides.
- Dimensions are in millimeters. The dimensions in brackets [x.x] are in inches.



Functional Specifications

This chapter contains the functional specifications of the DLT-V4 tape drive, including the LED functions.

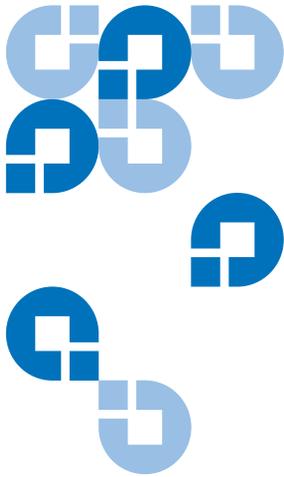
[Table 4](#) lists the key functional specifications of the DLT-V4 tape drive.

Table 4 Functional Specifications

Specification	Value
Formatted Capacity, Native Mode	160 gigabytes (GB)
Formatted Capacity, Compressed Mode ^a	320 GB
Interface	Low-Voltage Differential (LVD)
Tape Drive Type	DLT Derivative, streaming; 16-bit LVD
Recording Type	Partial Response Maximum Likelihood (PRML)
Read Compatibility ^b	DLT-V4, DLT VS160, DLT VS80 / DLT1
Write Compatibility	DLT-V4
Form Factor	5¼-in. Half-height
Sustained Transfer Rate, Native Mode	Up to 10 megabyte (MB) per second

Specification	Value
Sustained Transfer Rate, Compressed Mode ^a	Up to 20 MB / sec
Transfer Rate, Burst	160 MB / sec
Error Rate (Unrecoverable)	1 in 10 ¹⁷ bits (non-media error)

- a. Compressed values use a nominal 2:1 compression ratio. Actual compression ratios achieved depend on the redundancy of data files being recorded.
- b. Performance may vary when the tape drive reads data previously written to the DLT VS80 and DLT1 formatted data cartridges. Performance depends on the quality of the data cartridge you are reading, not the DLT-V4 tape drive.



Chapter 3

Performance Specifications

This chapter describes the performance specifications of the DLT-V4 tape drive, including timing characteristics, data cartridge and media characteristics, and the reliability factors of the tape drive.

Timing Characteristics

[Table 5](#) lists the timing characteristics of the DLT-V4 tape drive.

Table 5 Tape Drive Timing Characteristics

Specification	Value
Read/Write Tape Speed	118 inches per second
Rewind Tape Speed	160 inches per second
Linear Search Tape Speed	118 inches per second
Average Rewind Time	68 seconds
Maximum Rewind Time	135 sec
Average Access Time (BOT)	84 sec
Maximum Access Time (from BOT)	168 sec
Load to BOT – previously recorded tape	90 sec
Unload from BOT	22 sec (no brush), 61 sec (brush)

Data Cartridge and Media Characteristics

[Table 6](#) lists the data cartridge and media characteristics.

Table 6 Data Cartridge and Media Characteristics

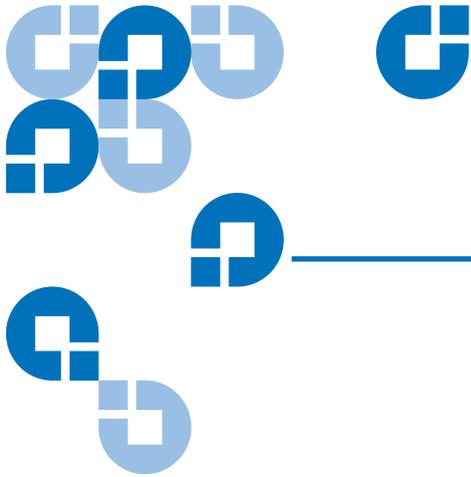
Characteristic	Specification
Media Width	0.5 in.
Media Length	1,847 ft
Media Type	Metal Particle
Data Cartridge Dimensions	4.1 in. x 4.1 in. x 1.0 in.
Shelf Life	30 years minimum @ 20 °C and 40% relative humidity (non-condensing)
Usage	600 hrs (150 full read/write uses)

Reliability Factors

[Table 7](#) lists the reliability factors for the DLT-V4 tape drive.

Table 7 Reliability Factors

Factor	Hours / Cycles	Comments
Head Life	30,000 tape motion hours	Continuous operation.
MTBF	250,000 hours	Quantum Corporation does not warrant that predicted MTBF is representative of any particular unit installed for customer use. Actual figures vary from unit to unit. MTBF is measured at 100% duty cycle, excluding head life.
Load/Unload	50,000 cycles	This excludes media errors.



Chapter 4 Power Specifications

This chapter describes the power specifications of the DLT-V4 tape drive.

Current Specifications

Note: The +5 Volt bus is $\pm 5\%$; the +12 Volt bus is $\pm 10\%$.

Table 8 Current Specifications

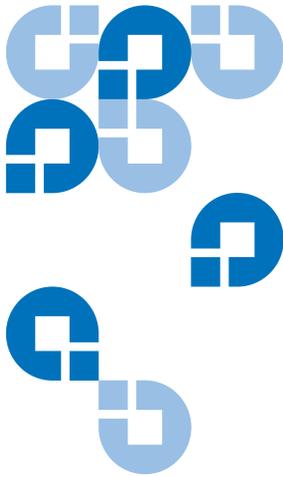
Mode	5V _{DC} Apk	5V _{DC} Arms	12V _{DC} Apk	12V _{DC} Arms	DC Pwr W (typ)	AC Pwr W (typ)	AC Pwr W (max)
Power Up	1.6	1.2	0.3	0.1	7.2	9	18
Load Tape	1.6	1.3	2.7	0.7	14.9	20	24
Unload Tape	1.6	1.3	2.6	0.8	16.1	20	24
Write Tape	1.9	1.6	1.4	0.5	14	20	21
Read Tape	1.9	1.4	1.3	0.5	13	19	21
Rewind	1.5	1.4	1.4	0.5	13	17	19
Idle (tape tensioned)	1.3	1.3	0.6	0.2	8.9	13	14
Idle (tape untensioned)	1.3	1.3	0.3	0.1	7.7	12	13
Idle (no tape)	1.3	1.3	0.1	0.1	7.7	12	13

External Power Supply and Chassis Requirements

This section lists the common mode noise limitations between enclosures. The noise level *cannot* exceed the values listed in the following table. All measurements must be administered with an active or differential probe to reduce oscilloscope ground loops.

Table 9 Common Mode Noise Limitations

First Enclosure	Second Enclosure	Common Mode Noise Limit Millivolt (mV)
Enclosure Chassis (Host Server, Workstation, or DLT-V4 Tabletop Enclosure)	DLT-V4 Tape Drive Chassis	<1 mV Peak to Peak
Enclosure Chassis (Host Server, Workstation, or DLT-V4 Tabletop Enclosure)	Power Supply Enclosure Ground	<300 mV Peak to Peak



Environmental Specifications

This chapter describes the environmental specifications of the DLT-V4 tape drive.

The tape drive operates in environments that include general offices and workspaces that consist of:

- Conditioned and marginally-conditioned areas with central or remote air-conditioning
- Complete temperature and humidity controls
- Moderate control tolerances
- Systems capable of maintaining consistent comfort levels.

The tape drive does not conform to environments that consist of:

- Marginal heating or cooling apparatus
- No humidity conditioning
- Uncontrolled tolerances
- Systems inadequate to maintain constant comfort levels.

For long-term trouble-free operation, we strongly recommend that you operate and store the tape drive in a clean, smoke-free environment.

The following tables provide the operating, non-operating, storage, and shipping environmental specifications for the DLT-V4 tape drive systems (both the internal and the tabletop configurations).

Temperature and Humidity Ranges

[Table 10](#) lists the operating temperature and humidity ranges of the tape drive.

Table 10 Operating Ranges

Specification	Value
Temperature Range	10 °C to 40 °C (50 °F to 104 °F)
Airflow	3.0 CFM (min.)
Wet Bulb Temperature	25 °C (77 °F)
Temperature Gradient	11 °C (19.8 °F) per hour (across range)
Temperature Shock	10 °C (18 °F) over two minutes
Relative Humidity	20% to 80% non-condensing
Humidity Gradient	10% per hour

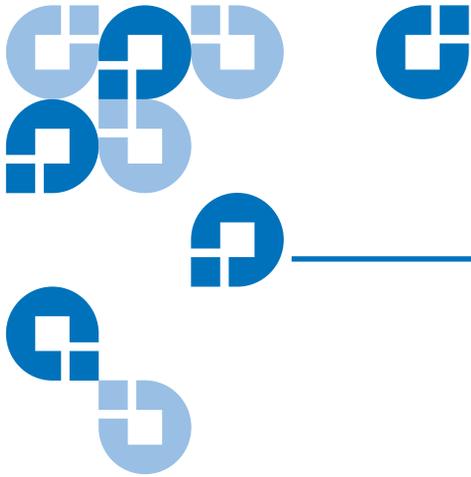
[Table 11](#) lists the non-operating storage and shipment temperature and humidity ranges of the tape drive.

Table 11 Non-Operating Ranges (Packed or Unpacked)

Specification	Value
Dry Bulb Temperature	-40 °C to 66 °C (-40 °F to 150.8 °F)
Wet Bulb Temperature	46 °C (114.8 °F)
Temperature Gradient	20 °C (36 °F) per hour with 5° margin (across the range)
Temperature Shock	15 °C (27 °F) with 5° margin (over two minutes)
Relative Humidity	10% to 95% non-condensing
Humidity Gradient	10% per hour

Altitude

The tape drive operates normally in pressures from -500 feet to 30,000 feet.



Chapter 6

Shock and Vibration Specifications

This chapter describes the shock and vibration specifications of the DLT-V4 tape drive. All testing was done on both the internal and tabletop tape drives.

Operating Shock and Vibration Specifications

Operating Shock Specifications

[Table 12](#) lists the shock specifications for the tape drive while it is operating.

Table 12 Half Sine Wave Pulse Shock Operating Vibration Specifications

Specification	5 G Shock	8 G Shock	62 G Shock
Pulse Shape	½ Sine Pulse	½ Sine Pulse	½ Sine Pulse
Peak Acceleration	5 G	8 G	62 G
Duration	11 millisecond (ms)	10 ms	2 ms
Application	X, Y, and Z axis, 10 pulses per axis (±), 60 total, 1 pulse every 6 seconds	X, Y, and Z axis, 1 pulse per axis (±), 6 total	X, Y, and Z axis, 1 pulse per axis (±), 6 total

Operating Vibration Specifications

[Table 13](#), [table 14](#), and [table 15](#) list the vibration specifications for the tape drive while it is operating.

Table 13 Random Overstress Operating Vibration Specifications

Factor	Criteria	Comments
Frequency Range	5 to 800 Hz	
Acceleration Level	0.5 G _{rms}	
Application	X, Y, and Z axis	Top to bottom, 10 minutes per axis (min.)

Table 14 Random Overstress
 Operating Vibration
 Specifications (PSD Spectrum)

Power Spectral Density (PSD) Spectrum	
Frequency (Hz)	PSD (G²/Hz)
5	0.0002113
20	0.0004225
200	0.0004225
800	0.0002113

Table 15 Sweep / Dwell
 Operating Vibration
 Specifications

Factor	Criteria	Comments
Frequency Range	5 to 500 to 5 Hz	1 - Upward and Downward Sweep
Acceleration Level	0.5 G, 0 to Peak	
Application	X, Y, and Z axis	Sweep Rate; ½ octave per minute Dwell on 4 lowest resonances per axis for 15 minutes each

Non-operating Shock and Vibration Specifications

Non-operating Shock Specifications

[Table 16](#) lists the shock specifications for the tape drive without its shipping package (non-operating).

Table 16 Non-operating (Unpackaged) Shock Specifications

Specification	40 G Shock	142 G Shock
Pulse Shape	Square Wave	½ Sine Pulse
Peak Acceleration	40 G	142 G
Duration	10 ms	2 ms
Application	X, Y, and Z axis, twice in each axis (once in each direction)	X, Y, and Z axis, twice in each axis (once in each direction)

Non-operating Packaged Vibration Specifications

[Table 17](#), [table 18](#), and [table 19](#) list the vibration specifications for the tape drive in its shipping package (non-operating).

Table 17 Random Survival Non-operating (Packaged) Vibration Specifications

Factor	Criteria	Comments
Frequency Range	5 to 200 Hz	
Acceleration Level	1.46 G _{rms}	
Application	X, Y, and Z axis	30 minutes per axis

Table 18 Random Overstress
 Non-operating Vibration
 Specifications (PSD Spectrum)

Power Spectral Density (PSD) Spectrum	
Frequency (Hz)	PSD (G²/Hz)
3	0.0144717
100	0.0144717
200	0.0036662

Table 19 Impact Drop Non-
 operating (Packaged) Shock
 (Drop) Specifications

Factor	Criteria
Test Type	Drop Shock
Drop Height	Internal Single Pack = 42 in. External Single Pack = 36 in.
Application	10 drops total; 1 each side, 3 edges, 1 corner

Non-operating Unpackaged Vibration Specifications

Table 20 Random Non-operating (Unpackaged) Vibration Specifications

Table 20, table 21, and table 22 lists the vibration specifications for the tape drive without its shipping package (non-operating).

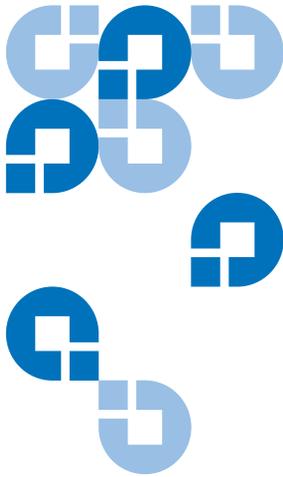
Factor	Criteria	Comments
Frequency Range	5 to 500 Hz	
Acceleration Level	2.41 G _{rms}	
Application	X, Y, and Z axis	30 minutes per axis (min.)

Table 21 Standalone Random Non-operating (Unpackaged) Vibration Specifications (PSD Spectrum)

Power Spectral Density (PSD) Spectrum	
Frequency (Hz)	PSD (G ² /Hz)
5	0.0201
100	0.0201
137	0.0107
350	0.0107
500	0.0052

Table 22 Sweep/Dwell Non-operating (Unpackaged) Vibration Specifications

Factor	Criteria	Comments
Frequency Range	5 to 500 to 5 Hz	1 - Upward and Downward Sweep
Acceleration Level	1.0 G _{rms} , 0 to Peak	
Application	X, Y, and Z axis	Sweep Rate; ½ octave per minute Dwell on 4 lowest resonances per axis for 15 minutes each



Emission and Immunity Specifications

This chapter describes the emission and immunity specifications of the DLT-V4 tape drive.

Emissions

The tape drive meets the following standards:

- FCC CFR Part 15 Class B (ANSI C63.4: 1992, IEC/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B)
- EMC Directive (89/336/EEC)
- EN 55022: 1998, +A1: 2000, +A2: 2003 Class B
- IEC/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B
- VCCI-03: 2004 Class B
- CNS 13438
- AS/NZS 3548
- ICES - 0003

Radiated Emissions

The tape drive meets the radiated emissions limits per IEC/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B listed in [table 23](#).

Table 23 Radiated Emissions Limits

Frequency Range Megahertz (MHz)	Quasi-peak limit decibel (dB) microVolt per meter ($\mu\text{V}/\text{m}$) @ 10m
30 to 230	30
230 to 1000	37

Conducted Emissions

The tape drive meets the conducted emissions limits per IEC/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B listed in [table 24](#).

Table 24 Conducted Emissions Limits

Frequency Range (MHz)	Limits dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^a	56 to 46 ^a
0.50 to 5	56	46
5 to 30	60	50

a. The limit decreases with the logarithm of the frequency.

Harmonic Current Emissions

The tape drive meets this standard: EN 61000-3-3: 2001, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

[Table 25](#) lists the odd harmonic limits for Class A equipment. The harmonics of the input current do not exceed the maximum permissible values given in this table multiplied by a factor of 1.5.

Table 25 Odd Harmonic Limits for Class A Equipment Limits

Harmonic Order (n)	Maximum Permissible Harmonic Current (A)
3	2.3
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \times (15/n)$

[Table 26](#) lists the even harmonic limits for Class A equipment.

Table 26 Even Harmonic Limits for Class A Equipment

Harmonic Order (n)	Maximum Permissible Harmonic Current (A)
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \times (8/n)$

Acoustic Noise Emissions

[Table 27](#) lists the acoustic noise emission levels, both as noise power and sound pressure for the tape drive. The table provides the preliminary declared values per ISO 9296 and 7779 / EN27779.

Table 27 Acoustic Noise Emissions, Nominal

Mode	Noise Power Emission Level (LwA, B)		Sound Pressure Level (LpAm, dBA) (bystander positions)	
	Internal	Tabletop	Internal	Tabletop
Idle	Not applicable	Not applicable	Not applicable	Not applicable
Streaming	5.8	5.8	54	54

Note: Current values for specific configurations are available from Quantum representatives.

[Table 28](#) lists the acoustic noise declaration for the German Noise Declaration Law.

Table 28 Acoustic Noise Declaration for German Noise Declaration Law

Schallemissionswerte – Werteangaben nach ISO 9296 und ISO 7779 / DIN EN27779

Gerät	Schalleistungspegel		Schalldruckpegel	
	LwA, B		LpAm, dBA (Zuschauerpositionen)	
	Leerlauf	Betrieb	Leerlauf	Betrieb
DLT-V4	N/A	5,8	N/A	54

Note: Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Quantum Corporation Equipment Vertretungen erhältlich.

Immunities

The tape drive meets the following standards:

- EMC Directive (89/336/EEC)
- EN 55024: 1998 Information Technology Equipment - Immunity (reference the basic standard IEC 61000-4-*n*)
- IEC/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B Information Technology Equipment - Immunity

Electrostatic Discharge (ESD) Immunity

The tape drive meets the ESD immunity limits per EN 61000-4-2: 2001 listed in [table 29](#) for operator access areas of the tape drive.

Table 29 Electrostatic Discharge (ESD) Immunity Limits

Specification	Performance Criteria
Contact discharge ± 8 kV	No operator intervention (soft recoverable errors allowed)
Air discharge ± 10 kV	
Air discharge (stress) ± 15 kV	
Survival ± 25 kV	No physical damage

Note: The product meets the product reliability levels (air discharge to 10 kV, with 15 kV desired).

Radiated Immunity

The tape drive meets the radiated immunity limits per EN 61000-4-3: 2002 listed in [table 30](#).

Table 30 Radiated Immunity Limits

Specification	Performance Criteria
80 to 1000 MHz, 1 kHz (80% AM) 900 MHz, 200 Hz, 3V/m	No errors allowed

Fast Transient Immunity

The tape drive meets the fast transient immunity limits per EN 61000-4-4: 2004 listed in [table 31](#).

Table 31 Fast Transient Immunity Limits

Specification	Performance Criteria
AC Mains ± 1 kV Signal Port ($L \geq 3$ m) ± 500 V	No operator intervention (soft recoverable errors allowed)

Surge Immunity

The tape drive meets the surge immunity limits per EN 61000-4-5: 2001 listed in [table 32](#).

Table 32 Surge Immunity Limits

Specification	Performance Criteria
Common/Differential Mode AC Mains ± 2 kV / ± 1 kV	No operator intervention (soft recoverable errors allowed)

Conducted Immunity

The tape drive meets the conducted immunity limits per EN 61000-4-6: 2003 listed in [table 33](#).

Table 33 Conducted Immunity Limits

Specification	Performance Criteria
0.150 to 80 MHz, 1 kHz (80% AM), 3V	No errors allowed

Power Frequency Magnetic Field Immunity

The tape drive meets the magnetic field immunity limits per EN 61000-4-8: 2001 listed in [table 34](#).

Table 34 Magnetic Field
Immunity Limits

Specification	Performance Criteria
50 Hz, 10 Amps per meter (A/m)	No errors allowed

Voltage Dips, Short Interruptions, and Variations Immunity

Table 35 Voltage Dips, Short
Interruptions, and Variations
Immunity Limits

The tape drive meets the AC dips, interruptions, and variations immunity limits per EN 61000-4-11: 2004 listed in [table 35](#).

Specification	Performance Criteria
95% Vreduction 10 milliseconds per 0.5 periods (Dips)	Soft recoverable errors allowed
30% Vreduction 500 ms per 25 periods (Dips)	Operator intervention allowed
95% Vreduction 5 sec per 250 periods (Interruptions)	Operator intervention allowed

Voltage Fluctuations and Flicker Limits

The tape drive meets this standard: EN 61000-3-3: 2001, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

[Table 36](#) lists the EN 61000-3-3: 2001 Fluctuation and Flickers limits.

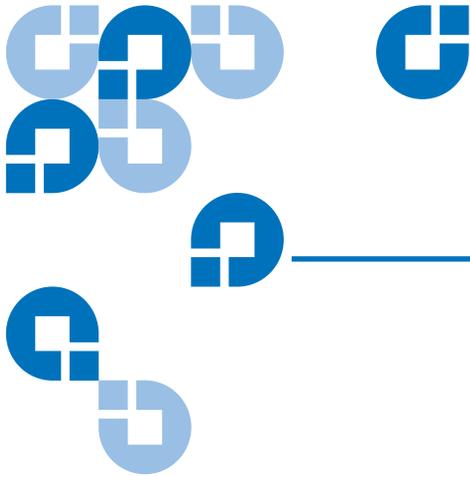
Table 36 Voltage Fluctuations and Flicker Limits

P_{st}	P_{lt}	d_c (%)	d_{max} (%)	d(t)ms
<1.0	<0.65	<3.0	<4.0	<200

Direct Current (DC) Magnetic Field Interference

The tape drive meets the following standards:

- IATA Dangerous Goods Regulations, 30th Edition, 1989-01-01
- U.S. CFR 49, paragraph 173.1020, rev. date: 1983-11-01



Chapter 8

Safety Specifications

This chapter describes the safety specifications of the DLT-V4 tape drive.

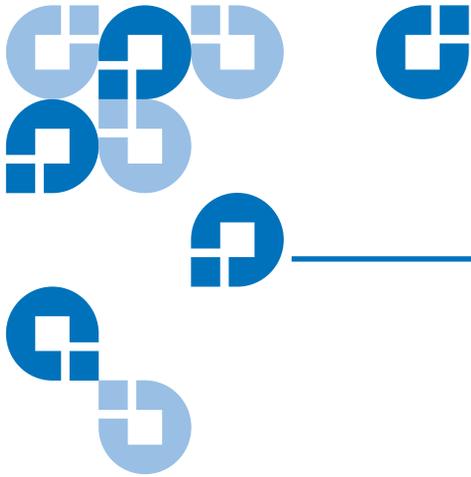
Safety Requirement

The tape drive meets the following standards:

- Low Voltage Directive (73/23/EEC)
- UL 60950 – US Standard: Safety of Information Technology Equipment including Electrical Business Equipment
- CSA C22.2 #950 – Canadian Standard: Safety of Information Technology Equipment including Electrical Business Equipment
- EN 60950-1:2001, 1st Edition – European Standard: Safety of Information Technology Equipment including Electrical Business Equipment

Consumer Bulletin Scheme

The tape drive meets this scheme: CB Scheme – The Scheme of the IECCE for Mutual Recognition of Test Certificates for Electrical Equipment.



Appendix A Regulatory Statements

Statements for Class A Equipment (Internal Tape Drive)

CE Notice (European Union)

Marking by the symbol **CE** indicates compliance of this tape drive to the EMC Directive (89/336/EEC), and Low Voltage Directive (73/23/EEC) of the European Union. Compliance with these directives implies conformity to the following European Norms (the equivalent international standards and regulations are in parentheses):

- EN 60950-1:2001, 1st Edition, Safety of Information Technology Equipment including Electrical Business Equipment
- EN 55024: 1998 (IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, 1000-4-8, 1000-4-11) - "Information technology equipment - Immunity characteristics - Limits and methods of measurement"
- Part 2 - Electrostatic Discharge (ESD) Requirements
- Part 3 - Radiated Electromagnetic Field Requirements
- Part 4 - Electrical Fast Transient/Burst (EFT) Requirements
- Part 5 - Surge Requirements

- Part 6 - Conducted disturbances, induced by radio-frequency fields Requirements
- Part 8 - Power frequency magnetic field Requirements
- Part 11 - Voltage dips, short interruptions and voltage variations Requirements
- EN 55022: 1998, +A1: 2000, +A2: 2003 Class B/CISPR 22: 1997, +A1: 2000, +A2: 2003 Class B, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."

The following standards only apply to the tabletop tape drive:

- EN 61000-3-2: 2000, Limits for harmonic current emissions (equipment input) current up to and including 16A per phase
- EN 61000-3-3: 2001, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

FCC Notices (U.S. Only)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Product Manual Statements for Class B Equipment (Tabletop Tape Drive)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged

to try to correct the interference by one or more, of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio /TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington D.C., 20402. Stock No. 004-00398-5.

All external I/O cables connecting to this unit need to be shielded. See the Product Manual or Quick Start Guide for cabling more options.

Caution: Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

FCC Label



IC Notice (Canada)

This Class [B] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [B] est conforme à la norme NMB-003 du Canada.

VCCI Notice (Japan)

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取扱説明書に従って正しい取り扱いをして下さい。

DEN-AN Notice (Japan)

すべての電源コードが同じ定格電流を使用するとは限りません。同封されている電源コードを他の製品と一緒に使用しないでください。また、家庭用の延長コードをQuantum製品と一緒に使用しないでください。複数の電源コードを必要とする製品の電源を完全に切るには、システムに接続しているすべての電源コードを外してください。

Class B ITE Translation

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

VCCI Class B ITE Regulatory Mark



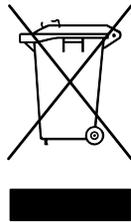
Environmental Compliance

Quantum is committed to providing quality products in an environmentally sound manner and to comply with all applicable environmental laws, rules and regulations.

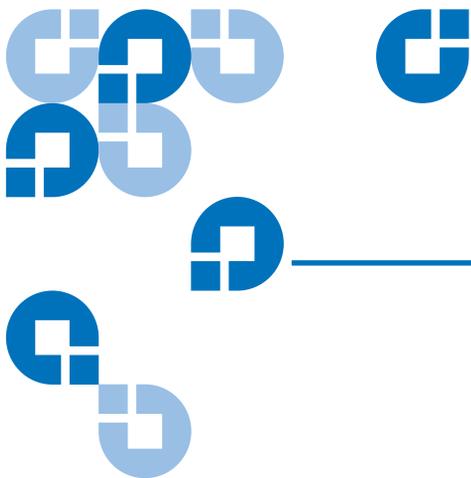
This product was designed, manufactured and made available with consideration to worldwide laws, rules and regulations applicable to the product and the electronics industry including the European Union Directives 2002/95/EC & 2002/96/EC (RoHS and WEEE).

For further information on Quantum's Environmental Compliance and Global Citizenship, please consult the following Web site at <http://qcare.quantum.com>.

Disposal of Electrical and Electronic Equipment



This symbol on the product or on its packaging indicates that this product should not be disposed of with your other waste. Instead, it should be handed over to a designated collection point for the recycling of electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please visit our Web site at <http://qcare.quantum.com> or contact your local government authority, your household waste disposal service or the business from which you purchased the product.



Glossary

A

Access (v.) To read, write, or update information on a storage medium, such as magnetic media. (n.) The operation of reading, writing, or updating stored information.

Access Time The interval between the time a request for data is made by the system and the time the data is available from the tape drive.

Advanced PRML Advanced Partial Response Maximum Likelihood. The advanced PRML channel technology provides high-encoding efficiency recording densities for greater capacity and performance.

Allocation The process of assigning particular areas of the media to particular data or instructions.

Archiving The removal or copying of data from the computer system onto secondary storage media that is safely stored away.

ASIC Application Specific Integrated Circuit.

ASTM American Society for Testing and Materials.

B

Backup A copy of a file, directory, or volume on a separate storage device from the original, for the purpose of retrieval in case the original is accidentally erased, damaged, or destroyed.

Bad Data Block A block that cannot reliably hold data because of a media flaw or damaged format markings.

Base Plate An aluminum die casting that acts as the support platform for the other modules and for the tape drive enclosure. The base plate includes the precision mounting holes used to install tape drives into a server or tape library.

Bezel (Also known as the faceplate.) A plastic panel that extends the face of a tape drive so that it covers a computer's tape drive bay opening.

BIOS Basic Input/Output System. A set of routines that work closely with the hardware to support the transfer of information between various elements of the system, such as memory, disks, and peripheral devices.

Block A sector or group of sectors. DLT-V4 supports block sizes up to 16 MB.

BOM or BOT Beginning of Media or Beginning of Tape. The physical beginning of the media.

BRC Backward-read Compatibility is the ability of a current tape drive product to read cartridges written on earlier model tape drives.

BSMI Bureau of Standards, Metrology, and Inspection (Taiwan).

Buckling Mechanism The buckling mechanism engages the media leaders on cartridge load and disengages them on cartridge unload.

Buffer An area of RAM reserved for temporary storage of data that is waiting to be sent to a device. The data is usually on its way to or from the tape drive or some other peripheral device.

Bus The part of a chip, printed circuit board, or interface designed to send and receive data.

C

C The degree Celsius (°C) is a unit of temperature.

Cache Specialized RAM used as a buffer between a fast CPU or I/O channel and storage which has a relatively slow access time (for example, cartridge or diskette), to avoid slowing down the former.

Cartridge Receiver At media insertion, the cartridge receiver assembly is responsible for guiding the media into its operating position, opening the door, unlocking the cartridge brakes, and securing the media for operation. At media ejection, the cartridge receiver assembly reverses the process and automatically ejects the cartridge a fixed distance from the front of the tape drive.

CE Council of Europe.

Compressed Capacity Capacity after data has been processed, using either software or hardware, to reduce storage space while maintaining data integrity. (See also Data Compression.)

CFR Code of Federal Regulations (United States).

CSA Canadian Standards Association, also known as CSA International.

CUP Code Update (a firmware update).

D

Data Compression A process that reduces the amount of storage space required to hold a particular block of data. Data transfer speed and total media capacity are affected by the data compression achieved. In accordance with industry practice, a typical compression ratio is 2:1 of data storage. Actual compression ratios achieved depend on the redundancy of data files being written.

dB A Decibel is a logarithmic unit of sound intensity; 10 times the logarithm of the ratio of the sound intensity to some reference intensity.

DC Direct Current is the continuous flow of electricity through a conductor such as a wire from high to low potential.

DCM The Data Control Module provides the path and guides for all media motion inside the tape drive and to write data to and read data from the media.

Device According to the SCSI specification, multiple SCSI devices can be connected to a single SCSI bus. Each SCSI device contains a SCSI ID number that can be set in the range 0 to 15.

Device Driver A low-level (usually kernel-mode) operating system component that enables a PC to communicate with peripheral devices such as printers, CD-ROMs, and tape drives. Each kind of device requires a different driver.

Differential A term referring to the electrical characteristics of the signal used on the SCSI bus interface. Differential signals minimize the effect of common mode signal noise and allow the SCSI bus to operate reliably over greater distances at a higher speed.

DLT Digital Linear Tape.

DLT/ice Quantum's firmware compliance management function of DLTSage, which provides secure archival functionality to the tape drive and tape cartridge.

DLTSage Quantum's suite of preventative maintenance diagnostic software tools that enables users to more simply manage tape storage environments.

DLZ Digital Lempel-Ziv 1 Algorithm is named after Abraham Lempel and Jacob Ziv. It is a data compression technique used in all tape drives.

E

EEC European Economic Community.

EEPROM Electronically Erasable Programmable Read-Only Memory. An integrated circuit memory chip that can store programs and data in a non-volatile state. These devices store firmware in tape drives, and can be erased and reprogrammed with new data.

EIM The Electronic Interface Module provides the main control function for the system and the interface from the system to the host computer, library, or autoloader.

EMC Electromagnetic Compatibility.

EMI Electromagnetic Interference.

EN EN standards are voluntary technical standards of the European Union and European Economic Area.

Encoding (n.) Characters (or bytes) of information converted to magnetic patterns on the media. (v.) The process of converting to the desired pattern.

EOD End of Data. Location on media where the last session stopped.

EOM or EOT End of Media or End of Tape. Logical EOM allows space to complete a write operation; physical EOM signifies that the media is completely used.

Erase The removal of data from media.

Error A message that occurs when there is a loss of ability to interpret recorded data; usually because of magnetic issues or defects in or on the media.

ESD An Electrostatic Discharge is a sudden flow of electric current through a material that is normally an insulator.

EU European Union.

F

F Fahrenheit is a temperature scale where a degree Fahrenheit (°F) is 5/9ths of a kelvin (or of a degree Celsius).

FCC Federal Communications Commission (United States).

Fibre Channel A high-speed serial architecture that allows either optical or electrical connections at data rates from 265 MB to 2 Gb per second. Fibre Channel is sometimes abbreviated FC.

Firmware Permanent or semi-permanent instructions and data programmed directly into the circuitry of a programmable read-only memory or electronically erasable programmable read-only memory chips. Used for controlling the operation of the computer or tape drive. Distinct from software, which is stored in random access memory and can be altered with ease.

FPM The Front Panel Module (also known as the bezel) is a plastic panel that extends the face of a tape drive so that it covers a computer's tape drive bay opening.

FUP Firmware Update.

G

GB Gigabyte

SI – 1,000,000,000 bytes or 10^9 . This is the International System of Units (SI) definition commonly used by telecommunications and storage manufacturers.

GiB – 1,073,741,824 bytes, equal to 1024^3 , or 2^{30} . This is the definition often used

in computer science, computer programming, and in the majority of computer operating systems documentation. This measurement can be abbreviated as GiB (gibibyte) to avoid ambiguity, as defined in IEC 60027-2.

Note: For the purpose of this document we are using SI.

GS German Safety.

H

Head The tiny electromagnetic coil and metal pole used to create and read back the magnetic patterns on the media. Also known as the read/write head.

HiFN An ASIC (Application Specific Integrated Circuit) for the system that handles data compression.

HIM The Host Interface Module implements the interface between the host system and the tape drive.

HRE Hard Read Error.

HWE Hard Write Error.

I

ICM The Integrated Controller Module contains the main controller and servo microprocessor, the custom-designed ASICs, and the cache memory.

IEC The International Electrotechnical Commission is a standards organization that prepares and publishes international standards for all electrical, electronic, and related technologies.

IEEE Institute of Electrical and Electronics Engineers

Interface A hardware or software protocol – contained in the electronics of the media controller and tape drive – that manages the exchange of data between the tape drive and computer. The most common interfaces for small computer systems are AT (IDE) and SCSI.

ISO The International Organization for Standardization is an international non-governmental standard-setting body made up of representatives from national standards bodies.

ISV Independent Software Vendor.

J

Jumper A tiny connector box that slips over two pins that protrude from a circuit board. While in place, the jumper connects the pins electrically. The jumper can be moved to change electrical connections.

K

KB A kilobyte is a unit of measure equal to 1 thousand (1024) bytes.

L

LED Light Emitting Diode.

LGMR Laser Guided Magnetic Recording.

LVD Low Voltage Differential signalling is an electrical signalling system that can run at high speeds over cheap, twisted-pair copper cables.

M

µM A Micrometer is an SI unit of length. It is defined as one millionth of a metre (1×10^{-6} m), equivalent to one thousandth of a millimeter.

MB Megabyte

SI – 1 000 000 bytes or 10^6 bytes. This is the International System of Units (SI) definition used by telecommunications engineers and storage manufacturers. 1 048 576 bytes - 1024^2 , or 2^{20} . This definition is often used in computer science and computer programming, when talking about the size of files or computer memory. The reason is that computers use the binary numeral system internally.

Note: For the purpose of this document we are using SI.

MRC Heads Magneto Resistive Cluster Heads. A cluster of small, cost-effective Magneto Resistive (MR) media heads packed densely together.

ms A Millisecond is equal to one thousandth of a second.

MSE Multi-mode Single-Ended is a signaling alternative for multi-mode SCSI devices that allows multi-mode SCSI devices to operate while SE SCSI devices are present on the bus.

MTBF Mean Time Between Failures.

N

Native Capacity The capacity of a given media product in its basic recording format (without the use of data compression).

Native Mode Refers to the uncompressed storage capacity of a media subsystem. (See Native Capacity.)

Node In referring to a Fibre Channel network, a node is any device attached to the network.

P

Parity A method of generating redundant information that can be used to detect errors in stored or transmitted data.

Peripheral A device added to a system as a complement to the basic central processing unit (CPU), such as a disk drive, tape drive, or printer.

Port In referring to a Fibre Channel network, a port connects a node to the network.

Positive Engagement Buckling Mechanism A highly robust, solidly engineered media leader-buckling mechanism for heavy-duty-cycle automated environments.

POST Power-on Self-Test. When power is applied to the tape drive, it performs a POST.

PRML Partial Response Maximum Likelihood is a method for converting the weak analog signal from the head of a magnetic disk drive into a digital signal. Also see [Advanced PRML](#).

PWA Printed Wiring Assembly.

R

Restore To replace data on the hard drive with data obtained from another media device.

RoHS Restrictions on Hazardous Substances is an EU directive that restricts, and in some cases bans, the use of certain compounds in the manufacture of electronic equipment. RoHS mandates that new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls (PBB), or poly-brominated diphenyl ethers (PBDE).

S

SAN Storage Area Network.

SATA Serial Advanced Technology Attachment. A Serial ATA International Organization (SATA-IO) standard for the interface between a computer and peripheral controllers.

SCSI Small Computer System Interface. An American National Standards Institute (ANSI) standard for the interface between a computer and peripheral controllers.

SDLT Super Digital Linear Tape.

SE Single-ended SCSI Mode. A term referring to the electrical characteristics of the signal used on the SCSI bus interface. For each signal that needs to be sent across the bus, there exists a wire to carry it. SE SCSI uses one line for each signal, with all lines using a common ground reference.

Seek The movement of a read/write head to a specific data track.

Server A powerful computer system with a large tape drive capacity that serves the information access and communication needs of multiple users.

Shelf Life The length of time that media can be stored without losing its magnetic strength. For VS1 media, this period is 30 years or more.

SI The International System of Units.

SRAM Static RAM. A memory chip that requires power to hold its content.

T

Take-up Reel The reel inside every tape drive onto which DLTtape or Super DLTtape media is wound. The in-the-tape drive take-up reel enables DLTtape and Super DLTtape systems to operate using a single-reel cartridge and thereby pack more media and data into every cartridge.

TapeAlert™ A firmware feature that monitors and returns the results of the tape drive's on-going self-diagnosis activity.

Tape Path The path through which media moves from the cartridge, past the read/write head, and onto the take-up reel.

TCM The Tape Control Module implements the functions required to buckle and unbuckle the media and control the media motion.

Termination A physical requirement of the SCSI bus. A terminator is a device that attaches to both ends of an electrical bus and prevents reflection or echoes of signals that reach the end of the bus.

Track A linear or angled pattern of data written on a media surface. SDLT tape drives write information on multiple tracks simultaneously.

Transfer Rate The speed at which the data moves between a host (that is, tape drive) and a recorded device. Usually expressed as bytes/sec or bits/sec.

TTL Transistor-to-Transistor Logic is a class of digital circuits built from bipolar junction transistors (BJT), diodes, and resistors. It is the base for the semiconductor integrated circuit (IC) technology.

TUR Test Unit Ready (see also [Take-up Reel](#)).

U

UL Underwriters Laboratories is a testing laboratory, which develops standards for consumer products, chiefly dealing with product safety.

Unformatted Capacity The total number of usable bytes on the media, including the space that will be required later to record location, boundary definitions, and timing information. (See also Native Capacity.)

Ultra 320 A tape drive SCSI interface that provides a low-voltage differential (LVD) mode running up to 160 MB/sec and a single-ended (SE) mode running up to 40 MB/sec.

USB Universal Serial Bus is a serial bus standard for connecting devices to a computer.

V

V A Volt is the potential difference across a conductor when a current of one ampere dissipates one watt of power.

VCCI Voluntary Control Council for Interference by Information Technology Equipment (Japan).

W

W The Watt is the SI derived unit of power.

WEEE Waste Electronic and Electrical Equipment is an EU directive that mandates that producers of electronic goods assume the responsibility of recycling WEEE and create sustainable development programs to design more easily reusable and recyclable products.

WORM Write Once Read Many is a functionality, which provides secure archived records needed for government compliance.

Quantum.

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