

Quantum®



DLT VS160

Tape Drive Product Specification



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Revision History

All revisions made to this document are listed below in chronological order.

Document Release	Date	Summary of Changes
002287-01 14	December 2002	Initial Release
002287-01 A15	Jan. 22, 2004	Converted to FrameMaker, using Quantum template and Style Guide per ECO C008880.
81-81275-01 A01	July 27, 2004	Changed the GB definition from 1,073,741,824 bytes to 1,000,000,000 bytes in the glossary; changed document part number per ECO C009974.
81-81275-01 A02	Sept. 14, 2004	Minor changes in Chapter 6. Per ECO C011131

User Manual 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/A11: 1997/(IEC 60950/A4: 1996), 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/(CISPR 22:1997), 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: 1995, Limits for harmonic current emissions (equipment input) current up to and including 16 A per phase
- EN 61000-3-3: 1995, 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.

User 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 User Manual or installation instructions for 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。

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





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CHAPTER 1

Introduction

This chapter describes the purpose, scope, and audience of this manual. It also lists related documentation and the conventions used in this manual.

1.1 Purpose and Scope

This manual describes the DLT VS160 tape drive, listing its physical, functional, and performance specifications, and describing the standards that the tape drive meets.

1.2 Audience

The primary audience for this manual consists of engineers and technicians interested in integrating the DLT VS160 tape drive into tape libraries and other equipment.

1.3 Related Documents

- *DLT VS160 Tape Drive Installation and Operations Guide (81-81191-01)*
- *DLT VS160 SCSI Interface Guide (81-81268-01)*

1.4 Structure of this Manual

The manual contains the chapters listed in [Table 1-1](#).

Table 1-1. Chapters in this Manual

Chapter	Description
Chapter 1, “Introduction”	This is the chapter you are reading now.
Chapter 2, “Physical Specifications”	Contains the physical description of the tape drive, including the environmental temperature and humidity specifications. This chapter also shows the tape drive’s mounting hole dimensions.
Chapter 3, “Functional Specifications”	Contains the functional specifications of the tape drive, including the LED functions.
Chapter 4, “Performance Specifications”	Describes the performance specifications of the tape drive, including timing, media, and the reliability of the tape drive.
Chapter 5, “Power Specifications”	Describes the power specifications of the tape drive.
Chapter 6, “Environmental Specifications”	This chapter describes the tape drive’s environmental specifications.
Chapter 7, “Shock and Vibration Specifications”	Describes the shock and vibration specifications of the tape drive.
Chapter 8, “Emission and Immunity Specifications”	Describes the emission and immunity specifications of the tape drive.
Chapter 9, “Safety Specifications”	Describes the safety specifications to which the tape drive complies.
“Glossary”	Provides a list of technical terms commonly used in the computer industry and abbreviations specifically used in this manual.

1.5 Conventions Used in This Manual

This manual uses the following conventions:

NOTE: *Notes* provide supplemental information.

TECH TIP: *Tech Tips* provide information that helps you complete a procedure or avoid additional steps.

CAUTION *Cautions* provide information you must know to avoid damaging the tape drive or losing data.

WARNING! *Warnings* provide information you must know to avoid personal injury.

1.6 Typographical Conventions

This manual uses the following conventions to designate specific elements.

Table 1-2. 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

1.7 Reader Comments

Quantum is committed to providing the best products and service. We encourage your comments, suggestions, and corrections for this manual. Please send all comments to this address:

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Physical Specifications

This chapter contains the physical description of the DLT VS160 tape drive, including the internal and tabletop tape drives, and the environmental temperature and humidity specifications.

2.1 Physical Description

2.1.1 Physical Dimensions and Weights

Table 2-1. Physical Dimensions



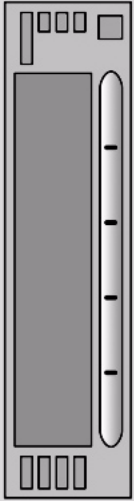
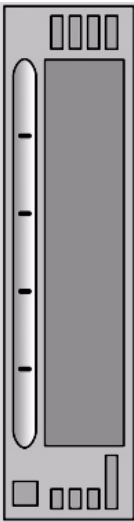
Specification	Internal Tape Drive	Tabletop Tape Drive
Height	1.656 in. (42.05 mm) with bezel 1.618 in. (41.10 mm) without bezel	2.608 in. (66.24 mm)
Width	5.748 in. (146.00 mm) behind bezel 5.807 in. (147.50 mm) with bezel	8.352 in. (212.13 mm)
Length	8.571 in. (217.70 mm) measured from back of front bezel 8.770 in. (222.75 mm) including the bezel	10.728 in. (272.49 mm)

Table 2-2. 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 configuration	11.81 lb (5.36 kg) depending on the configuration

Table 2-3 shows the acceptable operating orientation for the DLT VS160 tape drive.

Table 2-3. Proper and Acceptable DLT VS160 Tape Drive Orientation

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

2.1.2 Environmental Temperature Specifications

Table 2-4. Environmental Temperature Specifications

Specification	Value
Operating	50 °F to 104 °F (10 °C to 40 °C)
Non-operating	-40 °F to 150.8 °F (-40 °C to 66 °C)
Airflow	3.0 Cubic Feet per Minute (CFM) minimum

2.1.3 Environmental Humidity Specifications

Table 2-5. Environmental Humidity Specifications

Specification	Value
Operating	20% to 80% non-condensing
Non-operating	10% to 95%

2.2 Internal Tape Drive Mounting Hole Dimensions

Figure 2-1 shows the mounting holes and dimensions in a bottom view for the internal tape drive.

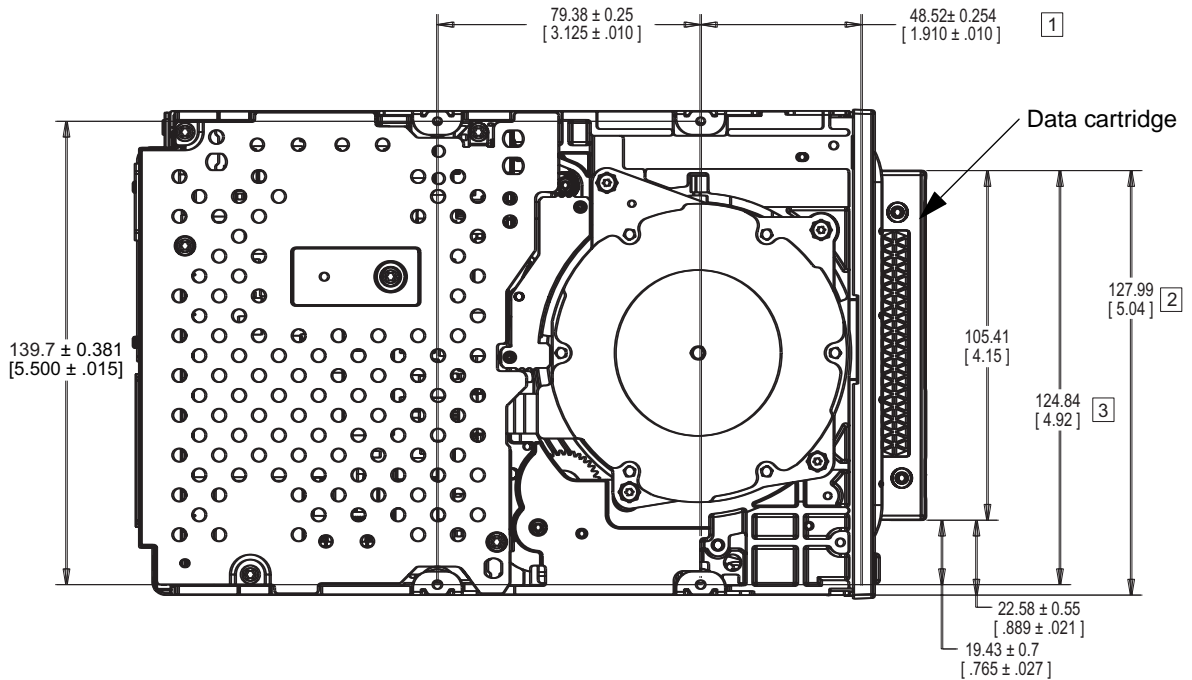


Figure 2-1. Internal Tape Drive Mounting Hole Dimensions (Bottom View)

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

Figure 2-2 shows the mounting holes and dimensions in a side view for the internal tape drive.

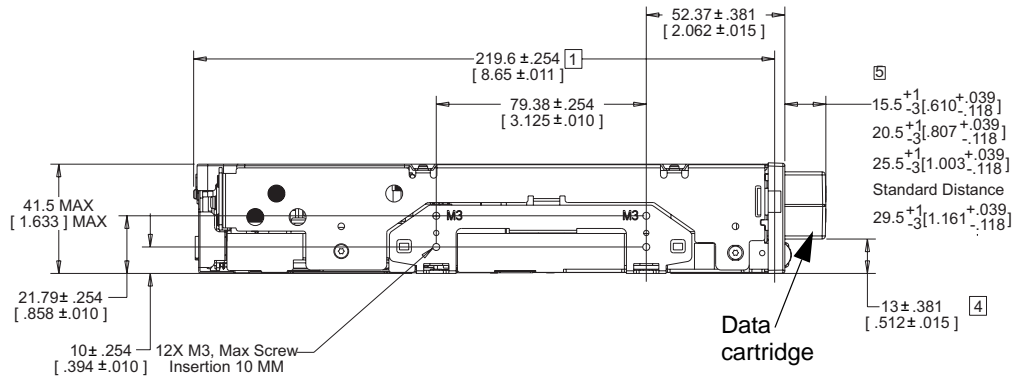


Figure 2-2. Mounting Hole Dimensions (Side View)

- NOTES:**
- 1 The dimension referenced in boxed note 1 [1] is from the front of the base plate.
 - 2 The dimension referenced in boxed note 4 [4] is from the bottom tape drive mounting plane to the interior guiding surface of the media opening.
 - 3 Boxed note 5 [5] states that the data cartridge is shown in the ejected position.
 - 4 The tape drive width and length are standard 5¼-inch form factor measurements.
 - 5 Dimensions are identical on left side and right sides.
 - 6 Dimensions are in millimeters. The dimensions in brackets [x.x] are in inches.

Notes



Functional Specifications

This chapter contains the functional specifications of the DLT VS160 tape drive, including the LED functions.

This table lists the key functional specifications of the DLT VS160 tape drive.

Table 3-1. Functional Specifications

Specification	Value
Formatted Capacity, Native Mode	80 gigabytes (GB)
Formatted Capacity, Compressed Mode ^a	160 GB
Interface	Wide Ultra SCSI 2, Low-Voltage Differential (LVD)
Tape Drive Type	DLT Derivative, streaming, 80 / 160 GB; 16-bit LVD
Recording Type	Partial Response Maximum Likelihood (PRML)
Read Compatibility ^b	DLT VS160, DLT VS80 / DLT1
Write Compatibility	DLT VS160
Form Factor	5¼-in. Half-height
Transfer Rate, Native Mode	8.0 megabyte (MB) per second
Transfer Rate, Compressed Mode ^a	Up to 16.0 MB / sec
Transfer Rate, Burst	160 MB / sec
Error Rate (Unrecoverable)	1 in 10 ¹⁷ bits (non-media error, clean tape drive)

- 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 VS160 tape drive.

3.1 LED Indicators

The tape drive has four light emitting diodes (LEDs). This section describes the functions of the LEDs.

NOTE: The front panel controls and indicators are in the same locations on both the internal and tabletop tape drives. The tabletop tape drive has a Power LED.

3.1.1 Power-On Self-Test (POST) Indicator Activity

Each time you apply power to the tape drive, or reset the tape drive, it performs a power-on self-test (POST). During POST, the LEDs illuminate one at a time, from left to right. First, the **Ready LED (Green)** comes on, followed by the **Fault LED (Orange)** approximately one second later, then the **Clean LED (Orange)** approximately one second later, then four seconds later the **Media LED (Orange)** illuminates. Each LED signifies a different portion of the power-on process. All LEDs turn off momentarily. If no data cartridge is loaded in the tape drive, the Ready LED then illuminates steadily and POST is complete. This process takes approximately eight seconds. If a data cartridge is in the tape drive during POST, the Ready LED flashes until the tape drive executes a mid-tape load, which can take several minutes. As POST completes, the tape drive makes a faint buzzing noise for several seconds. The noise associated with this activity is normal for this technology and does not indicate a problem with the tape drive.

3.1.2 Normal Operation — Ready LED Indicator Activity

During normal operation, the Ready LED displays one of the three following states. The Ready LED acts independently of the other LEDs.

Table 3-2. Normal Operation — Ready LED Indicator Activity

State	Description
Off	Indicates that there is no power to the tape drive.
On	Indicates that power is on, no data cartridge is loaded, or a loaded data cartridge is idle with no tape motion.
Blinking	A data cartridge is in the process of loading, or there is tape motion on a loaded data cartridge. Tape motion includes reading, writing, locating, rewinding, calibrating, and so on.

3.1.3 Normal Operation — Fault / Clean / Media LEDs Indicator Activity

The Fault, Clean, and Media LEDs work together to display the status of the tape drive.

Table 3-3. Normal Operation — Fault / Clean / Media LEDs Indicator Activity

Fault	Clean	Media	Description
○	–	⤵	Unsupported format, unsupported data cartridge type, or damaged data cartridge
○	○	●	A DLT1 (DLT VS 80) formatted DLTtape™ IV data cartridge is loaded.
○	⤵	–	Calibration error or permanent write/read error
○	●	○	Cleaning required—250 tape motion hours exceeded since last cleaning
○	⤵⤵	–	Cleaning in process
⤵	○	○	User invoked write/read diagnostic failed
⤵⤵⤵	○	○	Servo or mechanical error
●	–	–	Internal firmware error

Key	
–	Off
●	On
⤵	Blinking—slow (approximately once per second)
⤵⤵	Blinking—medium (approximately twice per second)
⤵⤵⤵	Blinking—fast (approximately three times per second)
○	Indicates that the status of this LED does not depend on the specific tape drive condition. This means that certain tape drive conditions may result in a combination of two or more of the LED states in the chart. For example, if you need to clean the tape drive while a DLT1 tape is loaded, both the Clean LED and Media LED are on steadily. If an internal write/read diagnostic fails due to a permanent write error, both the Fault LED and Clean LED blink slowly.

3.2 Unload Button Functions

You can use the unload button to unload and eject data cartridges, and for the additional features shown in the following table. Press and hold the eject button for the time specified in the following table to activate one of these features. Release the button when the LEDs display the desired sequence.

CAUTION The two features noted in the following table will over-write any data on the data cartridge. Do not use these features if the data cartridge in the tape drive contains critical data.

Table 3-4. Unload Button Functions

Description	Ready (green)	Fault (orange or clear)	Clean (orange or clear)	Media (orange or clear)	Hold Time (seconds)
Normal unload function	●	○	○	○	0 to 6
Reserved	⏻	–	–	–	6 to 9
Enter code load tape mode	⏻	⏻	–	–	9 to 12
Reserved	⏻	⏻	⏻	–	12 to 15
Reserved	⏻	⏻	⏻	⏻	15 to 18
Revert back to normal mode	●	–	–	–	18 to 21
Read/write diagnostic start. CAUTION: <i>This feature overwrites any data currently on the data cartridge.</i>	●	●	–	–	21 to 24
Reserved. CAUTION: <i>This feature overwrites any data currently on the data cartridge.</i>	●	●	●	–	24 to 27
Emergency Reset	●	●	●	●	27 to 30
Revert back to normal mode	–	–	–	–	30+

Key			
–	Off	●	On (orange or green)
⏻	Blinking	○	Unchanged from previous condition

3.3 Unload Button Actions

This section describes what happens when you release the unload button (as indicated in the previous section).

Table 3-5. Unload Button Actions

Function/Mode	Action
Normal unload function	Release the unload button to unload the data cartridge.
Enter code load tape mode	Release the unload button to accept a data cartridge that contains the firmware image (code load). The LEDs then indicate code load mode. Insert the data cartridge to begin the code update. The tape drive returns to normal operation if you do not load a data cartridge within 15 seconds.
Read/write diagnostic start	<p>CAUTION: <i>This feature overwrites any data currently on the data cartridge. Before performing this action, confirm that the data cartridge in the tape drive does not contain critical data.</i></p> <p>Release the unload button to start an internal read/write diagnostic. You must load a data cartridge to run the diagnostic. The tape drive writes and reads 400 MB of data, then unloads the data cartridge. This process takes approximately two minutes. The tape drive returns to normal operation if it detects no errors. The appropriate LEDs illuminate if an error occurs.</p>
Emergency reset	Release the unload button to force an internal reset. The tape drive initializes as if you turned power off and then on (POST).
Revert back to normal mode	Release the unload button to return the tape drive to normal operation.

3.4 Diagnostic Mode Event Codes

Press, hold, and release the unload button after six to nine seconds to start the diagnostic mode. This displays the most recent event code. The unload button then becomes a scroll button for additional event codes. Press and release the unload button for the next most recent event code. You can display up to five total events using this method. Refer to [Table 3-6](#) for details about the meaning of the various patterns.

After you display the final available event code, the next button press causes all LEDs to flash indicating that the next eight hex characters displayed are the detailed error code of the most recent event. The first character is either a hex E (error) or a B (bug check). You can look up the remaining seven characters in the error/bug check definition tables. When you display the last (eighth) detailed error code digit, the next button press returns the tape drive to normal operation. All indications are a four bit hex value.

During any time in this procedure, the tape drive returns to normal operation if you perform no scroll action within 15 seconds.

Table 3-6. Diagnostic Mode Event Codes

LED Fault Code	Failure
0001	SCSI Event
0010	General Error
0011	Software Bug Check
0100	Permanent Write Error
0101	Permanent Read Error
0110	Servo Fault
0111	Code Update was Completed
1000	Illegal Format
1001	Invalid Cartridge
1010	Calibration Failure
1011	Cleaning was Completed
1100	Directory Read or Write Failed
1101	Diagnostic Failed
1110	POST Failure
1111	Reserved



Performance Specifications

This chapter describes the performance specifications of the DLT VS160 tape drive, including timing characteristics, data cartridge and media characteristics, and the reliability factors of the tape drive.

4.1 Timing Characteristics

Table 4-1 lists the timing characteristics of the DLT VS160.

Table 4-1. Timing Characteristics of the Tape Drive

Specification	Value
Read/Write Tape Speed	122 inches per second
Rewind Tape Speed	160 inches per second
Linear Search Tape Speed	122 inches per second
Average Rewind Time	68 seconds
Maximum Rewind Time	135 sec
Average Access Time (BOT)	90 sec
Maximum Access Time (from BOT)	180 sec
Load to BOT — previously recorded tape	120 sec
Unload from BOT	25 sec

4.2 Data Cartridge and Media Characteristics

Table 4-2 lists the data cartridge and media characteristics.

Table 4-2. 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	1,000,000 passes (typical office/computer environment)

4.3 Reliability Factors

Table 4-3 lists the reliability factors for the DLT VS160 tape drive.

Table 4-3. Reliability Factors for the Tape Drive

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.



Power Specifications

This chapter describes the power specifications of the DLT VS160 tape drive.

5.1 Current Specifications

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

Table 5-1. Current Specifications of the Tape Drive

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	2.1	1.0	0.9	0.3	8.4	9	18
Load Tape	1.6	1.1	2.7	0.7	13.2	16	24
Unload Tape	1.6	1.0	2.6	0.8	14.1	16	24
Write Tape	1.8	1.6	1.3	0.5	14.6	20	21
Read Tape	1.7	1.4	1.3	0.5	13.3	19	21
Rewind	1.0	0.9	1.4	0.6	11.6	17	19
Idle (tape)	1.0	1.0	0.3	0.2	6.7	13	14
Idle (no tape)	1.0	1.0	0.1	0.1	5.6	11	12

5.2 External Power Supply and Chassis Requirements

This section lists the common mode noise limitations between enclosures. The noise level can *not* exceed the values listed in the following table. You must take all measurements with an active or differential probe to reduce oscilloscope ground loops.

Table 5-2. Common Mode Noise Limitations

First Enclosure	Second Enclosure	Common Mode Noise Limit Millivolt (mV)
Enclosure Chassis (Host Server, Workstation, or DLT VS160 Tabletop Enclosure)	DLT VS160 Tape Drive Chassis	<1 mV Peak to Peak
Enclosure Chassis (Host Server, Workstation, or DLT VS160 Tabletop Enclosure)	Power Supply Enclosure Ground	<300 mV Peak to Peak



Environmental Specifications

This chapter describes the environmental specifications of the DLT VS160 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 your DLT VS160 tape drive in a clean, smoke-free environment.

The following tables provide the operating, non-operating, storage, and shipping environmental specifications for the DLT VS160 tape drive systems (both the internal and the tabletop configurations).

6.1 Temperature and Humidity Ranges

Table 6-1 lists the operating temperature and humidity ranges of the tape drive.

Table 6-1. Operating — Temperature and Humidity 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 6-2 lists the storage and shipment temperature and humidity ranges of the tape drive.

Table 6-2. Storage and Shipment — Temperature and Humidity 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

6.2 Altitude

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



Shock and Vibration Specifications

This chapter describes the shock and vibration specifications of the DLT VS160 tape drive. All testing was done on both the internal and tabletop tape drives.

7.1 Operating Shock and Vibration Specifications

7.1.1 *Operating Shock Specifications*

Table 7-1 lists the shock specifications for the tape drive while it is operating.

Table 7-1. Operating — Half Sine Wave Pulse Shock 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 (\pm), 60 total, 1 pulse every 6 seconds	X, Y, and Z axis, 1 pulse per axis (\pm), 6 total	X, Y, and Z axis, 1 pulse per axis (\pm), 6 total

7.1.2 Operating Vibration Specifications

Table 7-2, Table 7-3, Table 7-4, Table 7-5, and Table 7-6 list the vibration specifications for the tape drive while it is operating.

Table 7-2. Random — Operating Vibration Specifications

Factor	Criteria	Comments
Frequency Range	5 to 50 Hertz (Hz)	
Acceleration Level	0.25 G _{rms}	
Application	X, Y, and Z axis	Top to bottom, 10 minutes per axis (min.)

Table 7-3. Random — Operating Vibration Specifications (PSD Spectrum)

Power Spectral Density (PSD) Spectrum	
Frequency (Hz)	PSD (G ² /Hz)
5	0.00005
20	0.00017
200	0.00017
500	0.000065

Table 7-4. Random Overstress — Operating Vibration Specifications

Factor	Criteria	Comments
Frequency Range	10 to 500 Hz	
Acceleration Level	0.5 G _{rms}	
Application	X, Y, and Z axis	Top to bottom, 10 minutes per axis (min.)

Table 7-5. Random Overstress — Operating Vibration Specifications (PSD Spectrum)

PSD Spectrum	
Frequency (Hz)	PSD (G ² /Hz)
10	0.000405
20	0.000689
200	0.000689
500	0.000264

Table 7-6. Sweep / Dwell — Operating Vibration Specifications

Factor	Criteria	Comments
Frequency Range	5 to 50 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

7.2 Non-operating Shock and Vibration Specifications

7.2.1 Non-operating Shock Specifications

Table 7-7 lists the shock specifications for the tape drive without its shipping package (non-operating).

Table 7-7. Non-operating (Unpackaged) — Shock Specifications

Specification	40 G Shock	142 G Shock	90 G Shock
Pulse Shape	Square Wave	½ Sine Pulse	½ Sine Pulse
Peak Acceleration	40 G	142 G	90 G
Duration	10 ms	2 ms	3 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)	X, Y, and Z axis, twice in each axis (once in each direction)

7.2.2 Non-operating Packaged Vibration Specifications

Table 7-8, Table 7-9, and Table 7-10 list the vibration specifications for the tape drive in its shipping package (non-operating).

Table 7-8. Random Survival — Non-operating (Packaged) Vibration Specifications

Factor	Criteria	Comment
Frequency Range	5 to 300 Hz	
Acceleration Level	1.47 G _{rms}	
Application	X, Y, and Z axis	30 minutes per axis

Table 7-9. Sweep/Dwell — Non-operating (Packaged) Vibration Specifications

Factor	Criteria	Comment
Frequency Range	5 to 200 to 5 Hz	1 – Upward and Downward Sweep
Acceleration Level	0.5 G _{rms} , 0 to Peak	
Application	X, Y, and Z axis	Sweep Rate: 1 octave per minute Dwell on 4 lowest resonances per axis for 5 minutes each

Table 7-10. Impact Drop — Non-operating (Packaged) Shock (Drop) Specifications

Factor	Criteria
Test Type	Drop Shock
Drop Height	Internal Single Pack = 48 in. External Single Pack = 42 in.
Application	10 drops total; 1 each side, 3 edges, 1 corner

7.2.3 Non-operating Unpackaged Vibration Specifications

Table 7-11, Table 7-12, and Table 7-13 lists the vibration specifications for the tape drive without its shipping package (non-operating).

Table 7-11. Random — Non-operating (Unpackaged) Vibration Specifications

Factor	Criteria	Comment
Frequency Range	5 to 500 Hz	
Acceleration Level	2.41 G _{rms}	
Application	X, Y, and Z axis	10 minutes per axis (min.)

Table 7-12. Standalone — Random Non-operating (Unpackaged) Vibration Specifications (PSD Spectrum)

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

Table 7-13. Sweep/Dwell — Non-operating (Unpackaged) Vibration Specifications

Factor	Criteria	Comment
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 VS160 tape drive.

8.1 Emissions

The tape drive meets the following standards:

- FCC Part 15 Class B (ANSI C63.4: 1992, CISPR22: 1997)
- EMC Directive (89/336/EEC)
- EN55022: 1998, Class B
- CISPR 22: 1997, Class B
- VCCI Class B
- CNS 13438
- AS/NZS 3548
- ICES – 0003

8.1.1 Radiated Emissions

The tape drive meets the radiated emissions limits per CISPR 22: 1997 listed in [Table 8-1](#).

Table 8-1. 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

8.1.2 Conducted Emissions

The tape drive meets the conducted emissions limits per CISPR 22: 1997 listed in [Table 8-2](#).

Table 8-2. Conducted Emissions Limits

Frequency Range (MHz)	Limits dB(μ V)	
	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.

8.1.3 Harmonic Current Emissions

The tape drive meets this standard: EN 61000-3-3: 1995, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

[Table 8-3](#) 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 8-3. 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 ≤ n ≤ 39	0.15 x (15/n)

Table 8-4 lists the even harmonic limits for Class A equipment.

Table 8-4. Even Harmonic Limits for Class A Equipment

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

8.1.4 Acoustic Noise Emissions

Table 8-5 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 8-5. 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 Corporation representatives.

Table 8-6 lists the acoustic noise declaration for the German Noise Declaration Law.

Table 8-6. 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 VS160	N/A	5,8	N/A	54

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

8.2 Immunities

The tape drive meets the following standards:

- EMC Directive (89/336/EEC)
- EN55024: 1998 Information Technology Equipment – Immunity (reference the basic standard IEC 61000-4-n)
- CISPR 24: 1997 Information Technology Equipment – Immunity

8.2.1 Electrostatic Discharge (ESD) Immunity

The tape drive meets the ESD immunity limits per EN 61000-4-2: 1995 listed in [Table 8-7](#) for operator access areas of the tape drive.

Table 8-7. Electrostatic Discharge (ESD) Immunity Limits

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

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

8.2.2 Radiated Immunity

The tape drive meets the radiated immunity limits per EN 61000-4-3: 1995 listed in [Table 8-8](#).

Table 8-8. Radiated Immunity Limits

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

8.2.3 Fast Transient Immunity

The tape drive meets the fast transient immunity limits per EN 61000-4-4: 1995 listed in [Table 8-9](#).

Table 8-9. 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)

8.2.4 Surge Immunity

The tape drive meets the surge immunity limits per EN 61000–4–5: 1995 listed in [Table 8-10](#).

Table 8-10. Surge Immunity Limits

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

8.2.5 Conducted Immunity

The tape drive meets the conducted immunity limits per EN 61000–4–6: 1996 listed in [Table 8-11](#).

Table 8-11. Conducted Immunity Limits

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

8.2.6 Power Frequency Magnetic Field Immunity

The tape drive meets the magnetic field immunity limits per EN 61000–4–8: 1993 listed in [Table 8-12](#).

Table 8-12. Magnetic Field Immunity Limits

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

8.2.7 Voltage Dips, Short Interruptions, and Variations Immunity

The tape drive meets the AC dips, interruptions, and variations immunity limits per EN 61000-4-11: 1994 listed in [Table 8-13](#).

Table 8-13. Voltage Dips, Short Interruptions, and Variations Immunity Limits

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

8.3 Voltage Fluctuations and Flicker Limits

The tape drive meets this standard: EN 61000-3-3: 1995, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

[Table 8-14](#) lists the EN 61000-3-3: 1995 Fluctuation and Flickers limits.

Table 8-14. Voltage Fluctuations and Flicker Limits

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

8.4 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

Notes



Safety Specifications

This chapter describes the safety specifications of the DLT VS160 tape drive.

9.1 Safety Requirement

The tape drive meets the following standards:

- Low Voltage Directive (73/23/EEC)
- UL 1950: 1995 – 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/A11: 1997 – European Standard: Safety of Information Technology Equipment including Electrical Business Equipment
- IEC 60950/A4: 1996 – International Standard: Safety of Information Technology Equipment including Electrical Business Equipment

9.2 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.

Notes



Glossary

The following is an alphabetical list of specialized words and technical terms with their definitions, commonly used in the tape drive and tape media industry, and specifically included in this manual.

A

A	Amps.
AC	Alternating Current.
AC Pwr	Alternating Current Power.
AM	Amplitude Modulation.
Apk	Amps Peak.
Arms	Amps Root Mean Square.
ASME	American Society of Mechanical Engineers.
ASTM	American Society for Testing and Materials.

B

BOT	Beginning of Tape. The physical beginning of the media.
-----	---

C

CFM	Cubic Feet per Minute.
CSA	Canadian Standards Association, also known as CSA International.

D

Db	Decibel.
dBA	Decibels, A-weighted.
d _c	The relative steady-state voltage change.
DC	Direct Current.
DC Pwr	Direct Current Power.
d _{max}	Maximum relative voltage change.
d(t)ms	Delta time in milliseconds.

E

ESD	Electrostatic discharge. A sudden discharge of electrostatic energy that can damage delicate electronic circuitry.
-----	--

F

FCC	Federal Communications Commission.
ft	Feet.

G

G	Gravitational Constant.
GB	Gigabyte. <ul style="list-style-type: none">• 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. <p>Note: For the purpose of this document we are using SI.</p>
GS	German Safety

H

Hz	Hertz. A measure of frequency (cycles per second).
----	--

I

IEC	International Electrotechnical Commission, an international standards organization for electronics and electrotechnical matters.
in.	Inch (or inches).

K

kg	Kilogram.
kHz	Kilohertz.
kV	Kilovolt.

L

L	Length.
lb	Pound.
LED	Light Emitting Diode.
LpAm, dBA	Declared A-weighted Sound Pressure Level, Decibels A-Weighted.
LVD	Low Voltage Differential. LVD is a physical interface with power low enough to allow integration within the SCSI controller chip. Ultra 160 SCSI uses a low-voltage differential interface.
LwA, B	Sound power A-weighted, Bells.

M

m	Meter (or meters).
MB	Megabyte. A unit of measure equal to 1 million bytes.
MHz	Megahertz.
mm	Millimeter.
ms	Millisecond.
MTBF	Mean Time Between Failure. The probable average number of service hours between failures.
mV	Millivolt.

N

n	Variable number.
---	------------------

P

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.
P_{lt}	Flicker evaluated over a long period of time (a few hours).
POST	Power-On Self-Test (POST). When power is applied to the tape drive, it performs a POST.
PSD	Power Spectral Density.
P_{st}	Flicker evaluated over a short period of time.

R

RH	Relative humidity.
rms	Root mean square.

S

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

U

UL	Underwriters Laboratory; a United States safety organization.
----	---

V

V	Volt.
V _{DC}	Volt Direct Current.
Vreduction	Voltage reduction.

W

W	Watt (or watts).
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