IBM LTO Ultrium Cartridge Label Specification (Revision 2)

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Notes:

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ABOUT THIS DOCUMENT

This document is intended to provide a functional specification for the cartridge barcode label used in automation solutions on LTO tapes.

Summary of Changes

Revision 0

First draft version.

Revision 1 - (July 2002)

- Added provision for using and labeling the Universal Cleaning Cartridge (UCC).
- Added general comment on Surface Reflectivity (page 2)

Revision 2 - (released March 2005)

- Modified to allow specific customer text. Sept 2004
- Definitions for Worm cartridge added. Oct 2004
- Added 'minimum' to the quiet zone length. Oct 2004
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Introduction

This document defines format and contents of the external label on a LTO cartridge. The requirements stated herein are defined to standardize the label and allow users to purchase or print labels. Specific automation solutions may have additional requirements beyond the scope of this document. The objective of this document is to establish uniformity of the label content.

The LTO cartridge label uses the bar code symbology of USS-39. A description and definition is available from the Automatic Identification Manufacturers (AIM) specification Uniform Symbol Specification (USS-39) and the ANSI MH10.8M-1993 ANSI Barcode specification.

The barcode string will consist of a start character, eight alphanumeric characters and the stop character. Quiet zones precede and follow the start/stop characters. The first six (6) characters may be any combination of upper case A-Z or 0-9 (e.g. ABC123) to identify the cartridge volume. The last two (2) characters are determined by the LTO cartridge media type (i.e. "L" for LTO and "1" for tape cartridge generation or drive manufacturer unique identifier).

No characters other than upper case alpha A-Z or numeric 0-9 are allowed.

Human readable characters are allowed provided there isn't a conflict or interference with the automation code. The format, colors and location of the human readable characters are at users specification.

Surface Reflectivity

The front surface of the label shall have a matte or non-reflective finish**.**

Encodation

The description/format of start, series of characters and the stop character is described in the AIM Uniform Symbol USS-39 specification.

Quiet Zone

The quiet zones are the areas preceding the start and after the stop characters and is clear of any printing or reflective properties that would cause spurious reflections. Per AIM Uniform Symbol USS-39 specification.

Optical Specification

The optical requirements and measurement techniques are further defined in the AIM Uniform Symbol USS-39 specification.

1. The print contrast of the Mcbeth PCMII shall be calibrated using the white calibration standard. All calibration and measurement shall be done with the filter select switch on position A.
2. The reflectivity of the white background, RW, shall be defined for use in note 3 as the reflectivity measured in the center of narrow spaces using the Mcbeth PCMII print contrast meter. RW shall be between 70% and 85%. This measurement should avoid isolated print defects and edge roughness.
3. A spot is defined as an area anywhere within the white background in which the reflectivity is less than 65%. No spot may be greater than 0,102 mm enclosed diameter. There may be no more than five (5) spots, in the bar code area, per label. No two spots may be within 0,254 mm of each other.
4. The reflectivity of the black areas, RB, may be measured anywhere within any black area on the barcode. The print contrast signal, PCS, shall be defined as (RW-RB)/RW and is to be measured using the Mcbeth PCMII print contrast meter. PCS shall be 0.85 minimum. The PCS measurement shall avoid isolated print defects and edge roughness.
5. A void is defined as an area within a black area in which the PCS is less than 0.85. No voids may be greater than 0,102 mm enclosed diameter. There may be no more than five (5) voids, in the bar code area, per label. No two voids may be within 0,254 mm of each other.

Physical Dimensions

The LTO label dimensions are derived using the AIM USS-39 specification. By cooperative agreement the recommended range of dimensions for LTO cartridges will be limited herein this specification.

1. Symbol height - 11,1mm minimum. As measured to the inside of the edge roughness.
2. Wide to narrow ratio - 2,75
3. Narrow element width - 0,432mm + 0,03/- 0,076 mm
4. Nominal width of the Wide spaces and bars is 1,188 mm.
5. Inter character gap - 0,432mm + 0,03/- 0,076 mm
6. Bar code element width maximum shall be measured to the outside of the edge roughness as defined in Note 10. Space width is then the distance between bar maxima.
7. Minimum quiet zones at beginning and end of printed barcode string - 10X narrow width = 4,32 mm. Total barcode string length (including quiet zones) nominal - 74,088 mm
8. The barcode string may be printed in either direction on the label. But, must begin/end with a valid start/stop character (✶).

9. The edge of the bar code shall be defined as the edge of all printed area attached to the bar. The edge roughness shall be defined as the transition encountered as a horizontal line is moved vertically from all black to all white. The edge roughness shall be 0,038 mm maximum
10. Unless otherwise specified, tolerances are X,XXX ± 0,127 mm, X,XX ± 0,762 mm.
11. Variation between all wide bars, white and black, shall be less than ± 0,0381 mm. Variation between all narrow bars, white and black, shall be less than ± 0,0381 mm.
12. The barcode string is printed on the label so it is on the side of the label towards the hub.
13. Label stock dimensions: Must fit within the label recess on the face of the cartridge without curling up on the sides or ends. (79 mm X 17 mm +0/- 0,8). Minimum length sufficient for the quiet zones, start-stop and data characters (nominal 74.088 mm). Minimum width no less than 1,5 mm narrower than the cartridge label recess width. Corners are cut with a 1,5 mm radius.

Human Readable Text

While the contents of the human readable text must include the data encoded in the barcode, this area of the label may be formatted to include customer defined text as agreed between the customer and the label vendor. Examples are shown in the figures on pages 7 and 8.

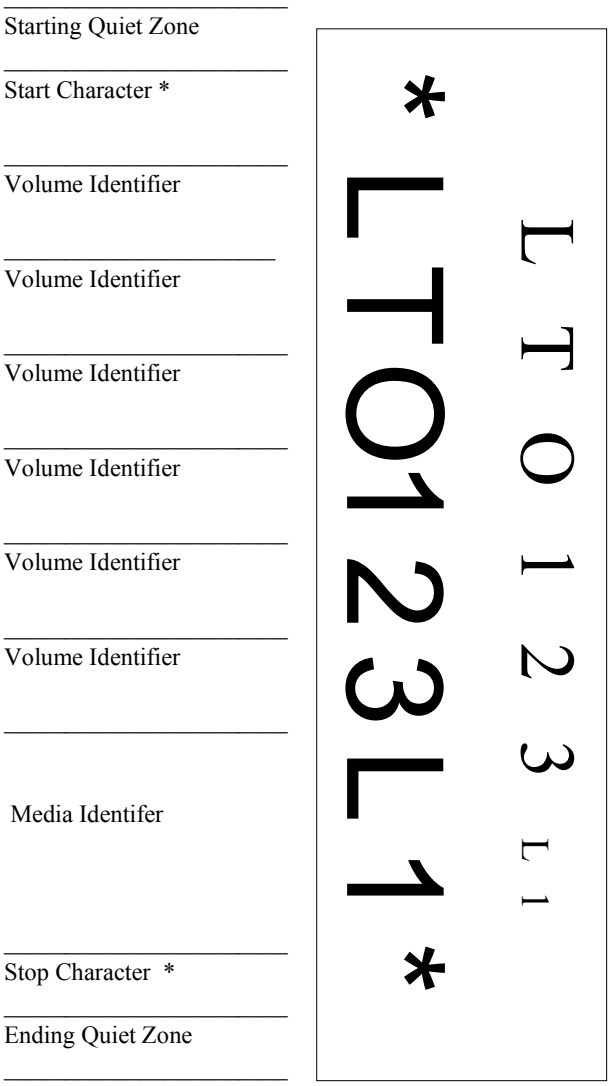
The human readable text must not interfere or intrude into the area defined for the barcode in any way. The specific customer text shall not be encoded in the barcode. The color of the characters and the background behind these human readable characters is by customer definition.

Volume Identifier Formats

1. The volume identifier will be limited to the use of ASCII characters A-Z (41h-5Ah), 0-9 (30h-39h) and the combinations of "CLN" and "DG(space) " as described herein.
2. The prefix "CLNvnnL1" will be reserved for cleaning cartridges. The "v" field will be an alphanumeric field to identify cleaning cartridge applications, "U" for Universal Cleaning Cartridges or a drive unique identifier. The "nn" alphanumeric field will be used to track individual cleaning cartridge activity. (i.e. usage and life) When the drive requires cleaning it will request loading of the unique type cleaner cartridge.
3. Diagnostic/Service cartridges will use the prefix "DG{space}vnnL1". The "v" field will be an alphanumeric field to identify a drive unique diagnostic cartridge if required. The "nn" alphanumeric field will identify a specific diagnostic cartridge volume.
4. The volume identifier field does consist of six (6) left justified alphanumeric characters. SCSI-3 Medium Changer Commands (SMC) ANSI NCITS 314-199X
5. The media identifier characters "Lg"are controlled characters. The "L" designates the LTO type of cartridge. The next character "g" (alphanumeric) will designate a generation and capacity of the LTO cartridge. Ultrium Generation 1 8-Channel Format Specification.

MEDIA CHARACTERS	DEFINITION	NATIVE CAPACITY
L1	Generation 1 Type A	100 GB
LA	Generation 1 Type B	50 GB
LB	Generation 1 Type C	30 GB
LC	Generation 1 Type D	10 GB
L2	Generation 2 Type A	200GB
L3	Generation 3 Type A	400 GB
L4	Generation 4 Type A	800 GB
LD		Future definition
LE		Future definition
LF		Future definition
LG		Future definition
LH		Future definition
LI	Not Used	
LJ		Future definition
LK		Future definition
LL		Future definition
LM		Future definition
LN		Future definition
LO	Not Used	
LP		Future definition
LQ	Not Used	
LR	Generation 1	100 GB WORM Format
LS	Generation 2	200 GB WORM Format
LT	Generation 3	400 GB WORM Format
LU	Generation 4	Future definition WORM Format
LV	Generation 5	Future definition WORM Format
LW	Generation 6	Future definition WORM Format
LX	Generation 7	Future definition WORM Format
LY	Generation 8	Future definition WORM Format
LZ	Generation 9	Future definition WORM Format

Barcode label (not to scale): Reference only - Normal text



Barcode label (not to scale): Reference only - Customer Defined text

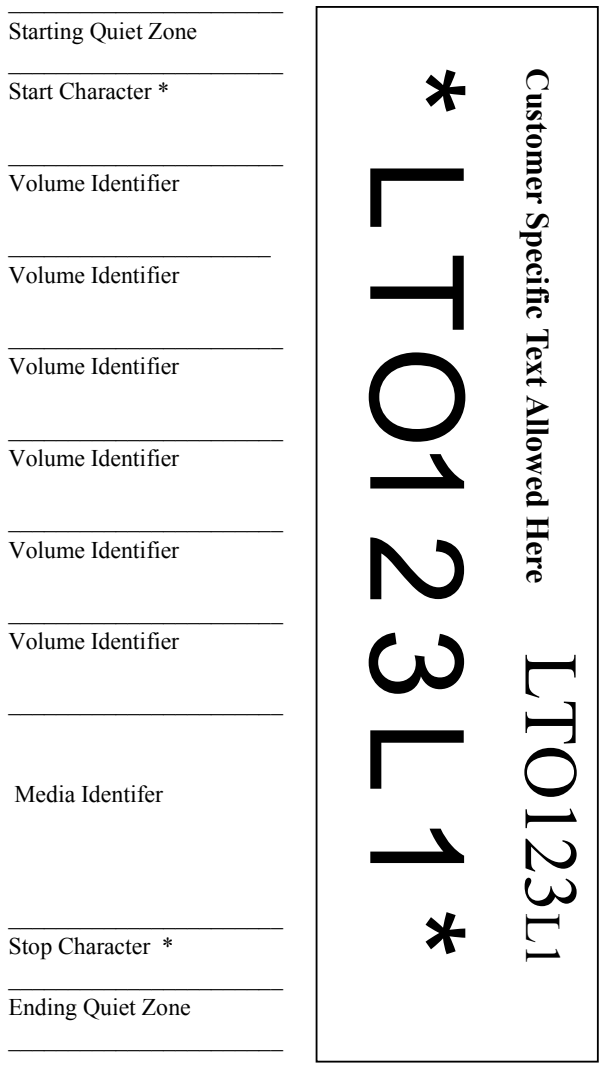


TABLE OF AUTHORITIES

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