

# Everything you wanted to know about data tape bar codes but were afraid to ask

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Bar codes are an integral part of most backup and archive procedures but are often taken for granted and implemented without too much thought. However, bar codes can play a much more significant role, embedding intelligence into the archiving process.

This white paper describes bar code basics and then addresses how bar codes can be utilized to manage archived data more effectively. Recent enhancements in bar code management by XenData software are then discussed.



## Background

There are over 300 different code types used for bar coding, the most common being the UPC (Universal Product Code) used on foodstuffs at the local supermarket. Virtually all robotic tape libraries use a different type of bar code: code 39, or as it is more often called '3 of 9' bar code. This code uses 3 wide and 6 narrow bars in a 9 bar code (hence the name) and the bars can be either black (non reflective) or white (reflective) The 39 type bar code labels have an asterisk "\*" as the start and stop characters but this is not printed as the humanly readable information - so don't bother looking for it on your tapes. All current professional backup/restore and archive management software utilize bar code labels to track the relationship between the physical and data content elements of the application. The bar code reader in a tape library is smart enough to figure out which way to read the label by the relationship of the lead in white space to the asterisk character in the code and the robotic controller keeps track of where the tape cartridge is located in it's inventory table. This information is passed to the backup or archive software application that is managing the robotic library allowing the software to write to or retrieve from a particular data cartridge.

Figure 1 below shows a typical LTO tape cartridge bar code label with eight alphanumeric characters.

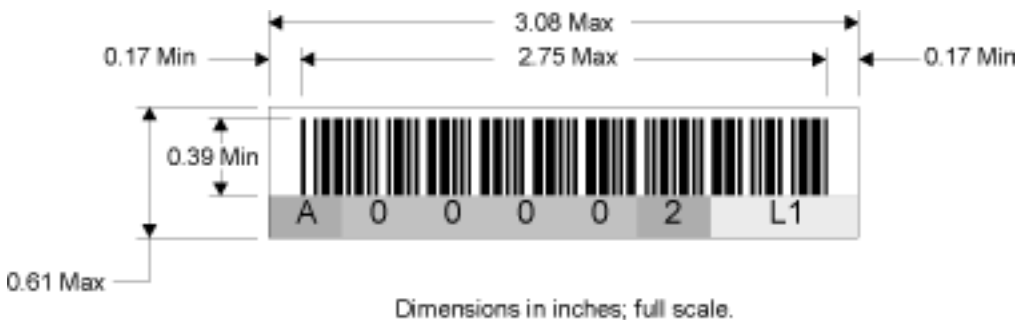


Figure 1

## Bar Code Information

What do the characters on the bar code on my tapes mean and is there any significance too them? The answer is yes there is significance. The bar code label comprises eight ASCII characters in the form:

**nnnnnnXY**

Where the **nnnnnn** part is the volume serial number and can be any six character alphanumeric combination (A-Z and 0-9) which results in 2,176,782,336 possible combinations

The **XY** part is used to identify the type of tape cartridge used. For example, L3 or L4 would be used with the current technology LTO3 and LTO 4 tape cartridges.

In addition to the human readable digits described above, a check digit may also be present in the machine readable bar code. This is not passed to the archive or backup application but is used by the bar code reader within the tape library to verify the integrity of the other digits. Many tape libraries can be configured to read either barcodes with or without a check digit. In these cases it is important to consistently use barcodes either with or without a check digit.

Then there are Cleaning Cartridges, which use the following format:

### **CLNvnnXY**

Where **CLN** denotes that it is a cleaning tape, **v** is the tape drive type, **nn** is the serial number and **XY** the type of media.

Other tapes such as DLT or AIT use different designators to ensure that only the correct media type for the specific tape drive is used. While it is possible to attach a bar code label from a different type of media to a tape cartridge .it is something that should never be attempted. Some robotics manufacturers use the label information exclusively for compatibility and, for example, will not load an LTO4 or a SDLT tape into an LTO1 drive.

Some robotic tape libraries and management software do not read any significance into the bar code tape cartridge label while others can operate without any bar code labels, reading only information stored on the tape in the cartridges. This severely impedes performance because each tape has to be loaded into a tape drive to verify it during the library initialization process that occurs at every power up.

## **Making Labels**

While it is perfectly possible to print bar code labels on inexpensive inkjet printers, there is a risk of reading errors when used in automated systems. To get accurate readings of the barcode labels, it is critical to have dense black bars, highly reflective white bars and a sharp transition between them. For this you need to use either industrial quality laser printers or thermal transfer printers. Professionally generated labels that are purchased from bar code label suppliers guarantee quality and consistency.

## **Specifying and Purchasing Labels**

Each robotic library manufacturer has a specification for the printed label, and while all of the major providers of robotic tape libraries will be glad to sell you labels, you can very easily get your own labels printed.

Sometimes the bar codes labels are hard to find on the tape library manufacturers' web sites. HP has them under 'Supplies and Accessories'. With Dell, just search for bar code labels. Qualstar, IBM, Quantum, Overland Data, Spectralogic and SUN Storagetek will all supply you bar code labels, some of them even already mounted on new tape cartridges.

There are some disadvantages to these labels purchased from the tape library manufacturer. You can only buy set ranges from some of the vendors like Dell. Whereas, manufacturers like HP will sell you a pack of labels touting that no two packs ever contain the same numbers. However, this means that you have no continuity between purchases.

You can easily find bar code labels to order on the internet by searching for either “**bar code**” or “**barcode**”. Many of the labels on sale on the internet come from EDP (<http://www.edpeurope.com/>) which is an excellent source if you wish to order specialized labels.

Remember to specify bar code labels with or without check digits. If you tell the bar code label vendor which library you are using, they should be able to advise you.

Using specific sequence bar code labels can improve your work flow and speed up restoring data from the shelf.

## **Backup, Archiving and Bar Codes**

For backup and recovery scenarios it makes sense to use clearly identifiable bar code sequences for tape sets that get rotated in and out of a tape library on a daily weekly or monthly basis.

For most archiving projects, bar codes have not been used to their full potential. Typical archiving software available today manages the “stored file to tape cartridge” relationship automatically but not intelligently. This means that there is no logical relationship between the archived files and the tape cartridge bar codes. However, one developer of archive management software, XenData, has added intelligent bar code management that makes life easier for the system administrator.

## **XenData Software adds Intelligent Bar Code Management**

XenData’s Archive series software now includes intelligent bar code management and provides:

- Automatic recording of the bar code to the in-cartridge memory chip
- Automatic selection of blank media in bar code order
- Automatic selection of matched barcodes for replicated tapes
- Mirroring across multiple tape libraries based on matched barcode selection

## **Recording the Bar Code to the In-Cartridge Memory**

When a tape cartridge is initialized in a tape library under XenData control, the bar code information is written to the in-cartridge memory chip. This is particularly useful when the tape has been exported from the library and inserted into a stand-alone tape drive. Tape drives do not contain bar code readers but can read the contents of the in-cartridge

memory. XenData software provides a consistent identification of tape bar code, even when a tape is being used in a stand-alone tape drive.

## **Tape Selection based on Bar Code Order**

It is impossible to keep tape cartridges in perfect numerical order in a tape library. Countless times first time operators have carefully loaded tapes into a robotic tape library in sequence only to discover that it is impossible to physically manage a robotics library with sequentially located tape cartridges. It simply doesn't work. Tapes are exported out of the library, a diagnostic test is run, new tapes are added, tapes are put on the shelf and replica tapes for disaster recovery are made resulting in tapes being loaded randomly in the physical robotic library.

Fortunately XenData software can manage this scenario very well. The software sorts through the inventory of blank media supplied by the robotics library and archives to tapes in barcode order, no matter where they are physically located inside the robot.

## **Matched Bar Codes for Replicated Tape Sets**

One of the key features of XenData software is tape cartridge replication. The software can be configured to automatically create replica tapes for disaster recovery purposes. This capability is typically used to create replica tape pairs and after a pair of tapes becomes full, one of the duplicate tapes is exported from the tape library and stored in a secure off-site location. The XenData software provides tape cartridge replication when using regular bar code sequences, but if matching but distinct barcodes are used, the software will use matched bar codes for replica tapes. For example, if we had the following sequence of matched pair bar coded tapes

**X0007AL4**  
**X0007BL4**  
**X0008AL4**  
**X0008BL4**  
**X0009AL4**  
**X0009BL4**

The XenData software would use the A letter tapes as a primary tape and make a replica on the matching B letter tapes before it would use any other blank tapes in the library.

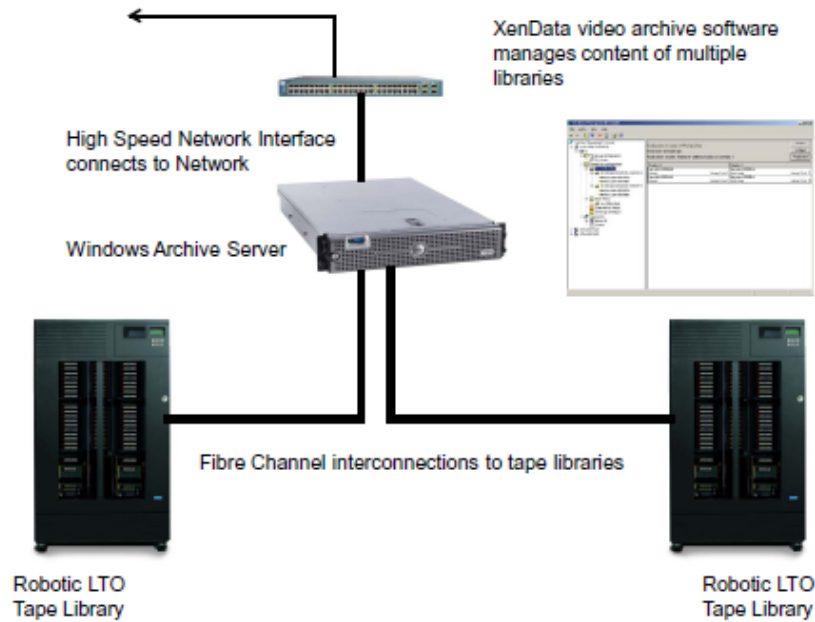
## **Using Matched Bar Codes for Mirroring Across Tape Libraries**

The concept of using matched bar codes for matched pairs of replicated tapes is taken one step further by XenData. The software will manage two or more tape libraries attached to a single server as shown in Figure 2 and by using matched bar codes loaded appropriately into the two libraries the system will mirror files across the libraries.

Using the A – B barcode sequence described in the previous section and putting all the A tapes into one tape library and the B tapes into the other, the software will

automatically mirror across the two tape libraries selecting matched pairs of bar codes for the replica pairs of tapes.

Figure 2. Configuration of a digital archive with two mirrored tape libraries.



## Conclusion

Intelligent bar code management is now an important part of any large archive system. The larger the archive, the more critical this becomes. So the next time you see a bar coded tape cartridge sitting on your desk, just don't take it for granted.