



# TRANSLUTION

## AN INTRODUCTION TO BARCODES

### INTRODUCTION

While it is not required to be an expert on the subject of barcodes and bar-coding to make use of the technology it is however important to understand some of the key points that will help you to make better decisions when it comes to selecting and implementing a solution in your business.

### HOW DOES A BARCODE WORK?

When data is displayed as a barcode, each character is represented by a pattern of wide and narrow bars. A barcode reader uses a photosensor to convert the barcode into an electrical signal as it moves across a barcode. The scanner then measures the relative widths of the bars and spaces, translates the different patterns back into regular characters, and sends them on to a computer or portable terminal. Every barcode begins with a special start character and ends with a special stop character. These codes help the reader detect the barcode and figure out whether it is being scanned forward or backward.

Some barcodes may include a checksum character just before the stop character. A checksum is calculated when the barcode is printed using the characters in the barcode. The reader performs the same calculation and compares its answer to the checksum it read at the end of the barcode. If the two don't match, the reader assumes that something is wrong, throws out the data, and tries again.

### WHY WOULD WE USE BARCODES?

When barcodes are used in the business process, it allows for procedures to be automated to increase productivity and reduce human error. The most common use of barcodes is to identify products in a warehouse with a barcode so that when the product is moved it can be scanned to keep track of where the product is at all times.

There are other places where barcodes could be used. For example, in a data entry work environment, workers may be required to enter an enormous amount of data into a customer database system. Instead of manually typing a customer identification number into a database, if the information is contained in a barcode, a data entry operator would be able to scan it in.

### WHAT IS A BARCODE SYMBOLOGY?

A barcode symbology is not the same as a standard. Every barcode standard uses a barcode symbology but two standards such as EAN13 and UPC14 can use the same symbology.

There are different barcode symbologies, each with its own particular pattern of bars. The EAN/UPC code used on retail products is an all-numeric code while Code 39 includes upper case letters, digits, and a few symbols. Code 128 includes every ASCII character code.

At Afrisoft, we generally use Code 39 as the symbology for barcodes for internal use because it is a robust and compact symbology. Code 128 tends to require more space on a barcode.

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## WHAT BARCODE STANDARD SHOULD I USE?

Selecting the right bar code is critical to the success of your bar code implementation plan, and here are some high level tips:

- Are there any industry standards that your codes will have to conform to, or is an important customer insisting on a specific label format? If so, you will probably have to use whatever barcode they want.
- If you are marking a retail product, you will have to use EAN-13 (EAN-8 is a special variant for small products) which uses the UPC symbology.
- If you are printing a bar code with variable information like serial numbers, expiry dates, or measures, then you will use GS1-128 (previously EAN128). GS1-128 uses the Code 128 symbology. The barcodes use a series of Application Identifiers to include additional data such as best before dates, batch numbers, quantities, weights and many other attributes needed by the user.
- If you will be labelling pallets or outer packaging that will be scanned by third parties then EAN 14 will be required. It also uses the UPC symbology. The EAN/UCC-14, also called U.P.C. Shipping Container Code, is a 14-digit number assigned to fixed-content shipping containers. The first digit, the indicator digit, can be "0" to "8" and indicates a packaging level and "9" a variable measure item. There is however, no worldwide consensus on which number indicates which packaging.
- If the product is itself a retail product it will need EAN 13. I.e. a can of coke is one EAN13 barcode. A sixpack is another and carton a third. A pallet however can have an EAN14 barcode.
- If the application is strictly for internal use you can choose anything you want. If you will ever need to encode letters as well as numbers, Code 39 or Code 128 would be a good choice. If you only need numbers, Interleaved 2 of 5 would do the job though Code 39 tends to be more robust and just as compact for numeric data.

## WHAT IS A 2D BARCODE?

2-Dimensional symbols are generally square or rectangular patterns that encode data in two dimensions. The primary advantage of 2-D codes is the ability to encode a lot of information in a small space. The practical limit for a standard barcode depends on a number of factors, but 20 to 25 characters is an approximate maximum; 2-D symbols can encode from 100 to about 2,000 characters. A good example of a 2D barcode is the South African driver's license. All the information on the license including the photograph and fingerprint is encoded into the barcode.

## HOW DO I GET A RETAIL BARCODE FOR MY PRODUCT?

If you are selling products you will probably need an EAN-13 code. These numbers are assigned by registration authorities in most countries; you can find the EAN authority for your area at <http://www.gs1.org>.

## DATA INTEGRITY?

A critical point when using barcodes is the integrity of the data. It is all very well to capture the barcode accurately because you are scanning it but if the information linked to that barcode is incorrect, the whole system will collapse. This is often an area that is ignored when implementing barcodes and the assumption that as long as all items have a barcode label the warehouse is ready to implement a scanning system is a dangerous one. It is well worth the time and effort to do a barcode audit. One simple way to do this with TransLution is to scan the barcode and configure the scanner to display the product description and/or stock code on the scanner. The user can then confirm that the description matches what they scan and move on to the next product. Spending a few days doing this before a go live can save an endless amount of heartache later.

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## WHAT INFORMATION SHOULD I PUT IN MY BARCODE?

If you are not driven by third party considerations there is a large amount of flexibility available to you when designing a barcode.

Say for example you have items that are serialised. You have the option of designing a barcode that contains both the item code and a serial number or you could just have a serial number on the item. Reading the barcode will tell you nothing about the item but in the database this serial number can tell you the stock code of the item, its current location, when it was scanned and even its movement history.

If you have products packed onto pallets you have a similar option – create a barcode for a pallet that just looks like a number but once scanned can show you all the details of what is on the pallet. Moving the pallet then means scanning one barcode and not every single item on the pallet.

## DO I USE A STOCK CODE AS A BARCODE?

With TransLution there is no need to use your ERP stock code as your barcode. You have the ability to link any barcode to a specific stock code. Of course you are not able to link two different stock codes to one barcode.

If you are implementing a new barcoding system and there are already barcode labels on your warehouse items that do not match your stock codes then this feature is very helpful and means that no re-labelling of stock is required. However, if your items are not already labelled and your stock code numbering system is accurate and robust, there is an argument that using the stock code as the barcode is a good idea. There is just that much less for users to learn and one possible area where data integrity can be compromised is removed. If your stock codes numbering is not very robust and stock code numbers end up being effectively text descriptions of 30 or 40 characters with spaces and other characters then using them as barcodes is probably not a good idea. This just leads to barcodes that may be too long to print on small labels. Under these circumstances using barcodes starting at 01 and incrementing numerically may be a good option.

## SHOULD WE EMBED QUANTITY IN A BARCODE?

It is possible to have a barcode that includes a stock code and a quantity so that when scanned, the operator has no need to tell the system how many items he is moving, the barcode already does that. This sounds like a good idea that will save time and reduce errors but like many ideas of this type needs to be approached with caution. If the intention is to pack a small product, for example washers, into bags and label each bag with the number of washers in the bag then the entire implementation has to be designed such that washers are never unpacked from the bag and if they are, the bag label must immediately be destroyed and new one reprinted with the new quantity on it. This is very often not possible which means that what may at first seem like a good idea is not suitable for all implementations.

## SCANNING BARCODES

### CONTRAST

In order to scan barcodes first time, every time an area of possible danger is that of the contrast between the bars and spaces. For the best possible scan, all the bars should reflect no light at all and all the spaces should reflect 100%. In practice this never happens, but bar codes will still read providing the lightness of the bars and the darkness of the spaces do not exceed certain limits.

Black bars and white spaces are best, but other colour combinations produce good scans, others definitely do not. Most scanners use red light, therefore any colour which reflects red light is suitable for spaces and any colour absorbing red light is needed for bars.

Shades and hues can vary, but here is a general guide on what can be used:

**Good Bar Colours:** Black, Green, Blue, Dark Brown

**Good Space Colours:** White, Red, Yellow, Orange

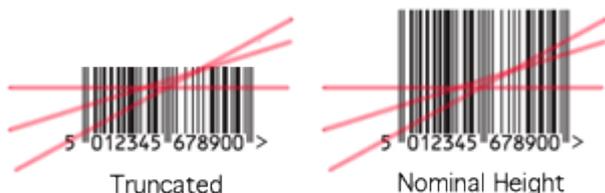
Also, make sure the material is not too glossy or the scanner light may reflect and will not properly read the barcode.

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## NOMINAL HEIGHT

The data contained within the bar code is read by moving a spot of light across the barcode, starting in the white space before the first bar and moving through all the bars and spaces to the white area at the other end of the code. If the spot of light moves off the edge of the code during the sweep, the code will not scan correctly.

The wider the code is the greater the chance of the beam going off the top or bottom before scanning the entire width. It is obvious that by increasing the height, the chances of a good scan are improved. For this reason, most barcoding specifications use a magnification factor which is expressed in percentage terms. For each magnification factor there is a nominal height so as the width of the barcode increases so does the height, maintaining the scanability. In working practice truncation (the reduction in height of the code without a reduction in width) is used. Care should be taken when truncating as scanning may be impaired.



## WHITE SPACE

Verify that enough white space has been allocated before and after the barcode. For most barcode types, the left and right margins need to be at least 10 times the X dimension to obtain a proper scan. In barcode technology, the X dimension is the narrowest part of a barcode's symbology.

The X dimension is used to determine a barcode's density, which is the amount of information that can be captured in a barcode within a specific amount of space. Other elements of a bar code are expressed as multiples of the X dimension. For instance, to ensure accurate scanning, most bar codes have a quiet zone whose width is 10X, or ten times the bar code's X dimension. In general, the greater the X dimension, the easier it is to scan a bar code.

## CONCLUSION

Starting out with a clear understanding of some of the important considerations when designing a barcode solution enable you to make the right decisions along the way and to design a solution that fits your business to give you the maximum benefits with the lowest risk.

