Ten Steps to Barcode Implementation

Introduction:

The most important implementation resource for barcode identification are the over 100 GS1 Member Organisations in countries all around the world. This guide takes new barcode users through the basic steps they must take to begin using barcodes.

Step 1: Get a GS1 Company Prefix

Before a company can begin using barcodes, they must first assign the numbers that go inside the barcode, called GS1 Identification Keys. The first step in assigning a GS1 Identification Key is to obtain a GS1 Company Prefix from a GS1 Member Organisation. The GS1 Company Prefix provides a way for companies to create identification keys for trade items, logistic units, locations, parties, assets, coupons, etc. which are unique all around the world. GS1 Company Prefixes are used by 1.3 million companies worldwide as the basis for creating unique numbers to identify everything in the supply chain.

Step 2: Assign numbers

After receiving a GS1 Company Prefix, a company is ready to begin assigning identification numbers to their trade items (products or services), themselves (as a legal entity), locations, logistic units, individual company assets, returnable assets (pallets, kegs, tubs), and/or service relationships. The process is simple. Your local GS1 Member Organisation can provide you with specific information about how many numbers you can assign based on the length of your GS1 Company Prefix.

Step 3: Select a barcode printing company

To begin, you should decide what you are barcoding and if the barcode will carry GS1 Identification Keys and attributes as static or dynamic information. If the information is static (always the same), the barcode can be printed using traditional printing techniques directly on the package (e.g., paper milk carton) or on a label that is applied to the package (e.g., label on a gallon milk jug).

If the information is dynamic, then either digital or a combination of digital and traditional printing will be required.

For example:
- If the product requires multi-colour graphics and a barcode with dynamic data, the graphics could be pre-printed using traditional printing presses and leave a blank portion of the label for digital printing inline during production and packaging.
- If the product only requires text and a barcode with dynamic data, a label could be printed inline and applied to the package (automatically if high volume or by hand if low volume). It could also be printed directly on the package itself without using a label.
- Also, a barcode with static data could be printed directly on the package using a digital printing method, for example when the same packaging is used for different products.

Step 4: Select a "primary" scanning environment

The specifications for barcode type, size, placement, and quality all depend on where the barcode will be scanned. By knowing where your barcode will be scanned you can establish the right specifications for its production.

Barcodes scanned at the retail point-of-sale currently need to support omnidirectional scanning.
If the barcode will be scanned at point-of-sale as well as in the warehouse, you will need to use a symbol that accommodates point-of-sale scanning but printed in a larger size to accommodate scanning in the distribution process.

Barcodes on healthcare items to be scanned in hospitals and pharmacies do not require omnidirectional scanning unless the items are also scanned at retail point-of-sale.

Step 5: Select a barcode

Selecting the right barcode is critical to the success of your barcode implementation plan, here are a few high-level tips:
- If you need to barcode a trade item that will be scanned at the retail point-of-sale (POS), the first symbol of choice is the EAN/UPC symbol. This symbol is guaranteed to be scanned by POS systems all over the world. In some cases, the use of GS1 DataBar or GS1 standardised 2D symbols may apply.
- If you are printing a barcode with variable information like serial numbers, expiry dates, or measures, then you will use GS1-128, GS1 DataBar, or GS1 standardised 2D symbols.
- If you want to encode a URL into a barcode to make extended packaging information available to the end consumer, then you should use a GS1 standardised 2D symbol.
- If you need to barcode an outer case to be scanned in a logistics environment, and you want to print directly on corrugated carton, GS1-128 or ITF-14 may be the choice for you.

There are other factors to consider so contact your local GS1 Member Organisation to see what implementation products and services they offer.

Step 6: Pick a barcode size

After the correct barcode symbol is specified together with the information to encode in it, the design stage begins. The size of the symbol within the design will depend on the symbol specified, where the symbol will be used, and how the symbol will be printed.

Symbol sizes
The X-dimension is the specified width of the narrowest element of a barcode. X-dimensions are used together with the symbol heights to specify the permissible symbol sizes.

For each scanning environment the relevant symbols are listed with their target X-dimension and corresponding target height. Besides the target sizes also the allowed minimum and maximum sizes are specified.

EAN/UPC symbols
EAN/UPC Symbols are designed for scanning by retail omnidirectional scanners. This means that EAN/UPC Symbols have two segments which are taller than they are wide. There is a fixed relationship between symbol height and width. When one dimension is modified, the other dimension should be altered by a proportional amount.

In order to decrease the amount of space EAN/UPC Symbols take up on a design, a decreased symbol height might be specified. This process, called truncation, is not permitted within EAN/UPC symbology specifications, and should be avoided. This is because of the negative impact it has on scan rates for retail omnidirectional scanners.

Consideration of the printing process
The final major consideration for symbol size is the capability of the selected printing process. The minimum size (magnification) and correct Bar Width Reduction (BWR) for a symbol varies by printing process. Printing companies should establish the minimum symbol size (magnification) and BWR to achieve acceptable and repeatable quality results.

See GS1 General Specifications, "GS1 System Symbol Specification Tables" for information on the allowed sizes and quality of all GS1 Symbols based on the application where they are used. Symbol Specification Table 1 provides the details for the retail point-of-sale scanning environment.

Step 7: Format the barcode text

The text typically beneath a barcode, called Human Readable Interpretation (HRI), is important because if the barcode is damaged or of poor quality to begin with, then the text is used as a back-up.

Here are some of the most frequently asked questions on HRI:

Does the Human Readable Interpretation need to be a certain size?
The human-readable text must be clearly legible and, in a size, proportional to the symbol size.

Is the Human Readable Interpretation supposed to be above or below the symbol?
HRI should be placed below the barcode and grouped together wherever physically possible while maintaining the HRI legibility and minimum barcode height.

I see parentheses around the Application Identifiers (AIs) under some barcode symbols. Are they supposed to be there and are they encoded in the barcode?
All AIs must be enclosed in parentheses in the Human Readable Interpretation, but the parentheses are not encoded in the symbol.

How many digits do I print typically beneath the EAN/UPC Symbol in the Human Readable text?
- You must print 12 digits below the UPC-A Symbol.
- You must print 13 digits below the EAN-13 Symbol.
- You must print eight digits below UPC-E and EAN-8 Symbols.

Step 8: Pick a barcode colour

The optimum colour combination for good contrast in a barcode symbol is black bars with a white background. If you want to use other colours, the following may help you in choosing satisfactory ones:

- GS1 barcodes require dark colours for bars (e.g., black, dark blue, dark brown, or dark green).

- The bars should always consist of a single line colour and should never be printed by multiple imaging tools (e.g., plate, screen, cylinder, etc.).

- GS1 barcodes require light backgrounds for the Quiet Zones (area free of printing around the barcode) and spaces (e.g., white).

- In addition to light backgrounds, "reddish" colours may also be used. If you have ever been in a darkroom with red lighting and tried to read red copy, you know it can virtually disappear. This is also true of similar colours such as orange, pink, peach, and light yellows. Given the fact that most barcode scanners use a red-light source, you can quickly see why these colours may be suitable for backgrounds but should be avoided for bars.

- In many cases the symbol background is not printed and the colour of the packaging substrate is used as barcode background. However, if the symbol background is printed beneath the bars, the background should be printed as solid line colours.

- If you use multiple layers of ink to increase the background opacity, each layer should be printed as a solid colour.

- If you use a fine screen to deliver more ink to the substrate, be sure there are no voids in the print caused by the screen not adequately filling in.

As explained, black bars and white spaces are the optimal combination, but other colour combinations can be used. Consult an experienced printing company recommended by your GS1 Member Organisation for additional guidance.

Step 9: Pick the barcode placement

When discussing symbol location, we are referring to the symbol placement on the design.

When assigning symbol placement first the packaging process should be considered. You should consult the packaging engineer to make sure the symbol will not be obscured or damaged (e.g., over a carton edge, beneath a carton fold, beneath a package flap, or covered by another packaging layer).

After determining the proper placement, the printing company should be consulted. This is because many printing processes require barcodes to be printed in a specific orientation to optimise printing processes.

To determine the proper location for GS1 barcodes, see the following topics in the GS1 General Specifications:

- General placement guidelines for point-of-sale
- Placement guidelines for specific package types
- Symbol placement for clothing and fashion accessories
- GS1 Logistic Label design
- Symbol placement used in general distribution
- Symbol placement for regulated healthcare trade items

Step 10: Build a barcode quality plan

ISO/IEC 15416 Barcode Print Quality Test Specifications for Linear Symbols and ISO/IEC 15415 Barcode Print Quality Test Specifications for 2D Symbols describe methods for assessing the quality of barcode symbols after they are printed. An ISO-based verifier looks at the symbol in the way a scanner does but goes further by grading the symbol's quality.

GS1 barcode standards utilise the ISO/IEC methods, specifying the minimum grade necessary for every standardised GS1 barcode based on which symbol is used, where it is used, or what identification number it is carrying. In addition to the minimum grade, GS1 also specifies the verifier aperture width and wavelength.

Setting up different minimum specifications is similar to a university using a standardised test to determine whether applicants qualify for admission. Several universities may utilise the same standardised test, but each sets the minimum score necessary for its applicants to be admitted.

GS1 General Specifications provide a quick reference list of symbol quality specifications depending on the symbol type, the application, and the GS1 identification key the symbol is carrying.