

Technical Note Specifying, Selecting, and Purchasing Location Barcodes

Introduction

BellHawk tracks the following in the "Containers" table in its database:

- Materials at a location, where the materials do not have a tracking barcode. This is what we call "loose" or untagged material. The materials are identified by a part number, quantity and lot number, at a location.
- Individual parts, assemblies, and kits that have a "license-plate" tracking barcode attached. Here the items are identified by a part number, have a quantity of one, as well as typically a serial number and a lot number.
- Containers, such as boxes, bags, rolls, reels, and barrels, of material, which have a tracking barcode attached, and which hold a quantity of a single part number and have attributes such as lot numbers and expiration dates.
- Parent containers such as Pallets and Cartons, which have a tracking barcode, and that may contain any combination of the above "child" containers.



All these "containers" have a location, which BellHawk tracks as materials are moved from location to location, such as from receiving, to a stock room, and then to production or from production to a warehouse and then to a staging area in shipping and finally onto a truck.

When recording the movement of materials, material handlers will record the location or container from which materials are being taken and then the location or container to which the materials are being moved. To make this movement easy for material handlers to record, we place "location" barcodes on shelves, racks, on or over floor locations, as well as on cabinets or refrigerators in which materials are stored.

In this document, we look at recommended options for these location barcodes and the tradeoffs these require as well as how these location barcodes correspond to locations setup in BellHawk using Excel spreadsheet imported into BellHawk.

For more details about how BellHawk stores data about materials it tracks in its Containers table, please see the document "How BellHawk Stores Inventory Information" which is available from a link on the Tech Notes page on www.BellHawkOnline.com. Other documents referenced in this document are available from the same source.

What is a Location Barcode?

A location barcode specifies a location at which materials may be stored. A typical location barcode that might be attached to a shelf is shown at right.

It consists of a one dimensional barcode, which contains the code for the location with the same code in human readable form. It may also contain arrows and other indicators to enable the selection of the correct barcode to scan for a shelf.



These barcodes are typically printed on a plastic substrate with the use of resin ribbons (for thermal transfer printing) or other durable inks (if colored) to make them as scuff and damage resistant as possible.

These barcode labels come with an adhesive backing that is suitable for attachment to metal shelves and have a peel-off paper backing. If these are to be attached to wood shelves, plastic surfaces, or used within refrigerated environments then labels with special adhesives may need to be ordered.

The horizontal width of the barcode depends on the number of characters to be encoded in the barcode plus start and stop bars and stripes plus white space that is required before and after the beginning and end of the barcode. It also depends on the width of the bars and stripes used to encode the characters in the barcode.

The width of the narrowest bar or stripe in the barcode sets the distance at which the barcode can be scanned because of the limitations of the angular resolution of the barcode scanning engine in the scanning device. This width is measured in thousandths of an inch or "mils". For shelf barcodes this width typically needs to be at least 20 mils for scanning at a range of about two to three feet. To scan at ranges of 8 feet or so, such as from the seat of a fork-lift truck, then the barcode should be typically 40 mil resolution.

These distances will be dependent on the angular resolution of the scanning device and its type (active laser or passive imager) and are provided here for general guidance. Please contact BellHawk Online for guidance as to the barcode widths and resolutions to use with specific barcode scanning devices in specific operational cases.

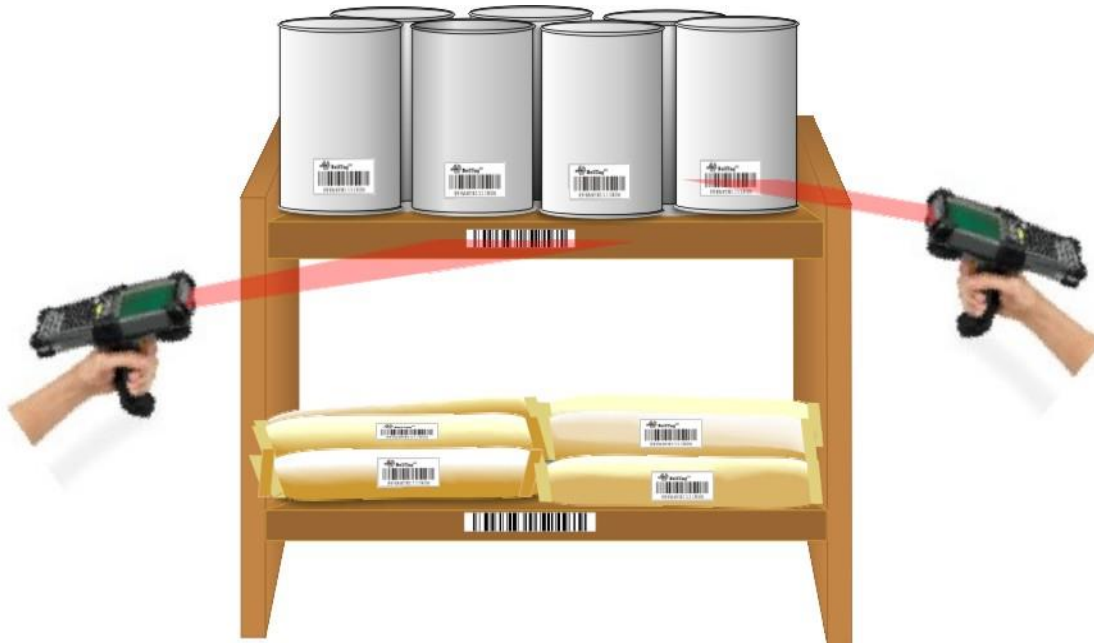
The reason that we use one dimensional barcodes rather than two dimensional barcodes for locations is that they can be read at longer ranges, especially by active laser scanners. Laser scanners are traditionally preferred for materials handling applications because it is easier to select the correct barcode when one barcode has to be selected from among many other barcodes nearby using the red illuminating line of the scanning laser. Because they actively illuminate the target barcode laser scanners are also less susceptible to optical interference than passive imaging scanners, which are needed to scan two dimensional barcodes.



Of recent years passive imaging scanners have improved dramatically in their resolution and are now starting to be used in materials handling applications as they are inherently more rugged and can be lower in cost. This may, in future, lead to a change to the use of two dimensional barcodes

for location barcodes as they can be read more reliably by imaging scanners. But for now, we recommend using one dimensional location barcodes, except in special applications.

Types of Location Barcode



A location barcode attached to a shelf can be used to record when containers of material with tracking barcodes or loose items are moved to a shelf. They can also be used for bins, which hold large items, such as shown below:



However, when tracking small items, such as fasteners, medical supplies, or tools then tracking, and especially picking, is made easier by attaching a "license-plate" container tracking barcode to the bin, as shown at right. The location of the bin can then be changed, if needed, by scanning the bin barcode and the new location barcode for the shelf on which it is placed. This provides flexible use of stock-room space as the product mix changes without replacing the barcodes that are permanently attached to the shelves.



These location and bin barcodes can then be scanned to record the movement of materials into and out of the bins or locations. They can also be scanned during "cycle counting" and inventory auditing to checking the amount of inventory present, in case someone has made a mistake in not recording the movement of inventory or has made an error in specifying the quantity moved or withdrawn.

Shelf barcodes work well when the shelves are at, or close to, eye level. But when warehouse racking is used, it becomes impossible to quickly and accurately scan barcodes placed on the high shelves. For this reason, we use a set of rack barcodes placed at eye level, on the rack verticals, as shown at right.

These rack barcodes:

- Are color coded as to the shelf level - to avoid mistakes. It helps if the shelf edges are colored (with tape or paint) to be the same color as the color used on the eye level barcodes.
- If fork-lift trucks are being used, have a barcode with large enough bars and stripes so they can be scanned by the driver without leaving his seat.
- Have an indicator arrow showing which set of shelves the barcodes belong to.



Many organizations also store materials on pallets in floor locations. Here there are three choices. Our preference is to use "traffic" cones with location barcodes attached to the top of these traffic cones, as shown at right. These are then placed inside a yellow lined floor area and the location barcode on the cone is scanned to record the location of any pallet placed within the floor area so marked.



The barcode on these location markers is located about 4 feet from the floor, and is large (typically 10"x6"), making it easy to scan by fork-lift truck drivers without leaving the seat of their truck. We recommend attaching the barcode (which is attached to a plastic board) to the cone by means of Velcro. In this way, when the fork-lift truck driver hits the cone with his truck, the cones can easily be stood up again and the barcode quickly reattached when it comes loose.

One alternative to these is to use overhead location barcodes hung over warehouse aisles, as shown here. The problem is that, in most industrial warehouses, these need to be hung at least 25' in the air, making them difficult to scan, even with expensive, long-range barcode scanners.



Another alternative is to use ceramic coated location barcodes epoxied to the warehouse floor. In our experience, these can easily become damaged in industrial use and are difficult to scan from the seat of a fork-lift truck.

The big advantage of the traffic cones is that they are inexpensive and that the warehouse floor locations can easily be changed, as needed, as different projects and products, need different amounts of floor space over time. Please see separate support document on "Inventory Marker Posts" for details.

Note that the barcodes should always be placed so that the bars and stripes are vertical, in a "picket-fence" arrangement. This is because all the handheld barcode scanning devices are ergonomically designed to be used with barcodes in this configuration. Also the height of the barcode should be chosen so as to allow for normal variability from horizontal in scanning.

Also note that barcodes should not be placed next to one another, horizontally, as this can lead to errors in selecting the correct barcode to scan. They can be placed together vertically, as in eye level rack barcodes, because it is easy to select the barcode to scan using a red aiming line from a one dimensional barcode scanner. But this can still lead to problems when using two dimensional imaging scanners, where a wider vertical separation is also required.

Choosing a Numbering Scheme

For location barcodes, we recommend using 6 to 8 characters. This gives enough characters for the barcode decoding algorithm inside the scanner to quickly and accurately decode the contents of the barcode. It also enables the use of wide-enough bars and stripes to make the barcode able to be scanned at a reasonable distance. If too few characters are used then the scan engine may not be able to accurately decode the contents of the barcode. If too many characters are used then the barcode becomes longer (approximately in proportion to the number of characters encoded) and the width of the bars and stripes in the barcode have to be made narrower to fit within the available space (such as the width of a warehouse rack) thereby reducing the range at which they can be scanned.

For warehouse racks, we recommend using a letter for each aisle or zone, followed by a number, for the rack bay, followed by a letter for the shelf height, such as is shown at right. These are much easier for material handlers to remember and use than some thing like "23.12.5".

Note that in the scheme shown at right, we use the full width of the vertical rack for the barcode (plus needed white space on either side) to maximize the size of the barcode and thus the distance at which it can be scanned.



Obtaining Location Barcodes

For testing BellHawk, you can setup some location codes in BellHawk, using an Excel import, as described in the next section, and print these out on an office printer. These are supposed to be printable on stock sheets of Avery labels but we have never had much luck getting the printer alignment correct. Even if you succeed, these labels are not robust enough for production use as they quickly become damaged in operational use.

You can enter the location codes you need in column A of an Excel spreadsheet and, design your own labels using software such as BarTender, and then print these out on a thermal transfer barcode label printer. You should be aware, however, that for industrial use, you should will need to print the labels out on plastic stock with suitable rack or shelf adhesive and use resin ribbons to ensure a reasonable barcode life as they are inevitably banged and scuffed in industrial use. This will require purchasing the correct barcode label stock and adjusting your barcode printer to print at the higher temperatures required for printing with resin ribbons on plastic

stock. You will also need an in-depth knowledge of the trade-off between the angular resolution of the barcode scan engines being used and the resolution of the barcodes used.

Our recommendation is that you leave the preparation of the location barcodes to the experts.

Please contact [Codeway Label Printing Bureau](#) for assistance.

Specifying Location Barcodes in BellHawk

Once a location numbering scheme has been decided upon then you need to enter these locations into BellHawk. This is done using an Excel spreadsheet import as is described in the "BellHawk License-Plate Materials Tracking User Manual".

Note that it is important that all the codes specified for the location barcodes are accurately replicated in the spreadsheet of locations imported into BellHawk. It is also critical that the location barcodes get applied to the correct rack and shelf location. It is for this reason that it is important to choose a coding scheme that is easily understood by your people.

Commentary

While placing location barcodes on racks, shelves, and floor locations may appear to be a very straight forward process, there are many decisions that need to be made correctly in order for the barcode data collection to be able to work correctly and the use of the scanning devices be ergonomically acceptable to their users.

We would much rather that our clients work closely with our support staff to get this right, early in the implementation of a barcode tracking project, than have to fix a badly implemented location barcode labeling deployment later in the project.

For assistance with your location barcodes, please contact the Codeway Label Print Bureau.

E-mail: identify@codeway.com