



### License-Plate Tracking Barcodes

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#### Introduction

One of the most useful techniques in tracking materials is the use of “license-plate” tracking barcodes. This technique is used by FedEx and UPS but is also applicable to many industrial organizations that need to track containers of material.



License-plate barcode labels can be simply barcodes, from a pre-printed roll, such as that shown here, each of which contains a unique sequence number. They are attached to each box, barrel, bag, reel, roll carton, barrel, or individually serialized item that companies wish to track. Alternately these license-plate tracking barcodes can be printed-on-demand along with human readable information on labels using barcode label printers.

#### Why “License-Plate” Tracking?

One of the common misconceptions in barcode tracking is that the tracking barcodes needs to contain all the information that you need to know about the contents of a container, such as the part number, the quantity, the manufacturer, the lot number and the expiration date. While there are contents standards, such as that specified by the GS1 organization, this results in very long 1D barcodes that cannot be easily decoded using low-cost barcode scanners or 2D barcodes that require the use of more expensive barcode scanners.

Instead, license-plate tracking places all the data about the contents of a container of material or a serialized item in a database record and then uses the tracking barcode attached to the container as a reference to the database record containing all the information about that container. As a result, we can use low-resolution 1D barcodes, such as that shown here, that can be scanned with low-cost imaging scanners.



The reason that these are called license-plate barcodes is that their use is modeled after what happens at the registry of motor vehicles when you go to register a new car or truck. They do not take out a blank aluminum license plate and hammer into it the make and model and VIN for your truck. Instead, they take a uniquely numbered license plate and enter all the information about your new car or truck into a database. This is so that, when you are pulled over for speeding, the police officer can enter your license-plate number into his on-board computer and immediately see all the needed information about you and your car or truck.



We do the same thing with license-plate tracking except that we do not use aluminum license plates. Instead we place a unique tracking barcode on each container and then scan it to enter or retrieve all the information about the contents of the container. This can include recording adding or withdrawing material to or from the container as well as recording a new location for the container.

### **Advantages and Disadvantages of Pre-Printed Rolls of License-Plate Barcodes**

The big advantage of using pre-printed rolls of license-plate barcodes is that they are inexpensive and easy to use. You can have many rolls being used, at multiple locations or being carried around by material handlers, with each roll containing uniquely numbered barcodes. There is no need for multiple barcode printers or to train people how to load ribbons or media into barcode label printers or how to fix jams or other problems.

The big disadvantage is that the license-plate number does not give any human readable information about the contents of the container. This is similar to the license-plate number on your car or truck. But many containers already have all the needed information already printed or labeled on them by their manufacturers, so this is not a disadvantage. That is, unless, the labeling is in Chinese or some other language not readily understood by your material handlers.

If you need human readable information on the label then the label should be printed with a unique license plate-tracking barcode along with human readable information, such as the part number and description. Note that it is recommended that information such as the quantity in the container and its location not be placed on such a label so that these can be recorded in the database, whenever they are changed without needing to reprint the label.

The use of license-plate barcodes requires that an organization use software such as BellHawk that has the ability to use pre-printed rolls of license-plate barcodes as well as to pre-print or print-on-demand barcode labels with human readable information as well as a license-plate tracking barcode.

Even those organizations that do want to print out barcode labels with human readable information for the raw materials and finished goods often find that using pre-printed rolls of barcodes is very useful for tracking work-in-process (WIP). Here the labels just need to exist for the time that an item or container of items is being processed. Then a final label is placed on each finished item or container and the WIP tracking barcode is discarded.

### **Recommended Label Formats**

While the contents of these labels could simply be a sequential number, we do recommend the following:

1. Use 1D barcodes with 10 mil minimum line width to make the labels readable by a wide range of barcode scanners.
2. Use code 128 as the base code for the labels to make sure they are universally readable.



3. Make sure that you have adequate white space on either side of the barcode to enable it to be read – the label shown here has 5/16” white space - the label supplier or the barcode label layout program will guide you as to the minimum while to use.
4. Use at least 10 characters on the label to give the barcode scanner electronics enough sample data to decode the label format being used and to overcome any imperfections in the label.
5. Prefix the tracking number with a # sign or other unique character followed by three characters identifying your organizational unit. This will avoid confusion, as you do not want duplicate labels. It also enables the tracking software to warn the user if they scan some other label on a container, such as one that was placed there by its manufacturer.
6. Make sure each roll starts with a unique tracking number. Again, you do not want to have the same tracking barcode on different containers. To make sure that that numbers are unique, one person in your organization should be charged with issuing the starting and ending numbers to be on each roll.
7. Do make sure that you have the tracking number printed in human readable form under the barcode. This is so that this tracking number can be manually entered if the barcode becomes unreadable.

### **Types of Label**

The most inexpensive type of label is paper labels printed with a wax ribbon. We normally use 2”x1” labels such as shown above. These are for short-term use on discardable containers. Typically they come in rolls of 1,000 barcodes per roll.

For other applications we have used:

1. Plastic labels printed with resin ribbon. These are more durable and suitable for use where there may be abrasion on the label.
2. Plastic labels printed with UV resistant resin ribbons for outdoor use.
3. Reduced height, high resolution and 2D labels for limited space applications
4. Duplicate side-by-side labels for application on two sides of the same container to make scanning easier.
5. Labels with peel-off license-plate barcodes for vendor managed inventory and other similar applications where scanning is deferred from time of use.

### **Commentary**

BellHawk Systems used to act as an intermediary for its clients, purchasing these labels and then reselling them. We are pleased to share the knowledge we have gained over the years with our clients, and to assist them on a consulting basis. We find, however, that our clients are best served by purchasing their barcode labels directly from the manufacturers of these labels so that clients can get exactly the labels they need for each specific application at the lowest possible price. Please contact the author for recommendations as to appropriate suppliers.

## Author

Dr. Peter Green is the President and Chief Technology Officer of BellHawk Systems Corporation. BellHawk Systems provides software and related services that enables industrial organizations to implement technology solutions to their operational problems. Clients include manufacturers, food processors, distributors, laboratories, engineering and other industrial organizations, primarily in the North Eastern USA.



Dr. Green received his BSEE and Ph.D. in Electronics and Computer Science from Leeds University in England. He was a member of the technical research staff at MIT and was a Professor at WPI. Dr. Green is a member of APICS and is a speaker at their professional development meetings. For the past two decades Dr. Green and his team have implemented a wide range of technology solutions to operational problems for clients ranging from small manufacturing companies to the US Air Force and Navy.

If you have comments or suggestions, or would like to discuss a specific problem you are trying to solve, please contact Dr. Peter Green by Email at [Peter.Green@BellHawk.com](mailto:Peter.Green@BellHawk.com). Also please see [www.BellHawk.com](http://www.BellHawk.com) for details of our BellHawk<sup>®</sup> and Bell-Connector<sup>™</sup> technologies that we use to solve issues such as those discussed in this paper.

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