

# PDF417 Encoding Guide

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## Overview

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Encoding two-dimensional barcodes such as PDF417 is inherently more complex than traditional one-dimensional (or linear) barcodes. A larger number of things can be altered and adjusted, making it harder to specify how to construct the barcode. This document is intended to serve as a starting point, allowing you to understand the variables that will make a barcode that is compatible with ExpoTools equipment.

## The Terms

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A PDF417 barcode is not specified simply as a height and width with a dot-size. Typically, it is specified using 4 basic parameters:

- X-element: size of the smallest barcode element (or dot)
- X-to-Y ratio: how many times larger that the x-element is the y element
- Number of columns: how many bands are encoded on a line
- Error correction level: how much redundant information is added to the barcode to allow scratches or defects. Increasing this adds to the size of the barcode

From these, the height, or number of rows, is derived. In addition, a symbol set can be specified as either text, binary or numeric. Although text mode allows more characters to fit inside the same space, it is usually best to use binary mode, since it can be difficult to ensure that the data does not contain any control characters.

## Capacity

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Although ExpoTools barcode scanners can read up to 480 characters from a badge, such a barcode would prove very difficult for the average user to scan, or at least be overly large for most badge designs. In order to make the badges as easy to scan as possible, you should try to keep the average badge at around 150 characters, with an upper limit of 250 characters. For registration information this is typically more than sufficient.

## Size and Shape

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Assuming the 250 character information content and an error correction level of 3, the following combinations are typically workable:

Size	X-element	X-to-Y ratio	Columns	Comments
2.25" by 0.75"	0.012"	2	7	good general purpose design
3.2" by 0.6"	0.015"	2	10	longer but shorter design
3.2" by 0.7"	0.015"	2.5	10	larger, but very easy to scan
2" by 0.45"	0.010"	2.5	10	smaller, requires more training to scan easily

These sizes provide a good balance between area and ease of scanning for the user. Other configurations will work, but may prove more difficult for the untrained operator to scan. In general, try to keep the barcode about three times wider than it is tall. Avoid long, skinny barcodes, such as 4 inches by 0.5 inches, as the user must hold the scanner

farther back to see the entire code. This is counter-intuitive for most people, as they will typically move the scanner closer in, as opposed to further back, when having trouble scanning.

### **The Printer**

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PDF417's require high quality printers due to the small element size. As such, you should plan on using good quality 600 DPI or more laser printers and white badge stock. In general, inkjet and thermal/wax printers do not offer high enough quality output for PDF417 printing, and cost more to operate than typical laser printers.

### **The Badge Holder**

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Whatever badge design you arrive at, you must test the resulting barcode with the badge holder that will be used at the show. Two problems arise. The first is that the reflective surface of the badge holder makes the barcodes harder to scan. Holding the scanner at a slight angle helps alleviate this, but a code that scans on plain paper will always prove more difficult to scan once in the badge holder. The second problem is that many shows use badge holders with opaque or coloured stripes. If these overlay the barcode, they can make it impossible to decode.

### **Placement**

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Be careful not to place the barcode too close to the edge of the badge, as paper misalignment can cause part of the code to print beyond the perforation. This can make the code unreadable. Also beware of the aforementioned colour stripes.

### **Testing**

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When testing the badge design, be aware that most users will not have the same familiarity with the equipment as you. As such, what is easy for you to scan may prove difficult for a new user, since they have little or no understanding of how to position the scanner. Also note that when testing, make sure you are using a badge with the maximum number of characters that will be encoded. Test badges often contain only small amounts of data, and this makes them easier to scan, but they are not representative.

### **Other 2D Barcodes**

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PDF417 is not the only two dimensional symbology that can be used with ExpoTools. Other symbologies, such as micro-PDF, Data-matrix or Aztec offer advantages over standard PDF417, and are compatible with the BC500 scanners. For example, the same information could be encoded as an Aztec barcode only 1.3" x 1.3", and this barcode would be exceptionally easy to scan.