



Two-Dimensional Bar Codes

Two-Dimensional Bar Codes Overview

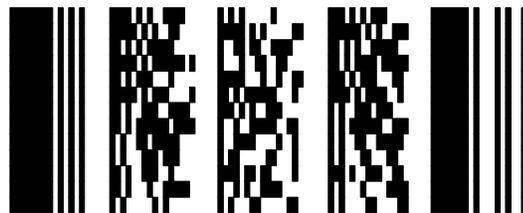
Two-dimensional bar codes contain data along two axes, allowing you to encode more information on a product or label than with a traditional one-dimensional bar code. Two-dimensional bar codes are used when:

- space is limited,
- more data needs to be encoded,
- a central system is in place to accommodate additional identification data, or
- an application requires a database on an item.

An example of a two-dimensional bar code is PDF417, or Portable Data File 417.

PDF417 Introduction

PDF417 is a “stacked” (or multi-row) code, made up of short, closely packed linear bar codes. It is capable of encoding over one thousand characters of data per label. This is important for applications where a bar code must be more than an identifier and convey additional information. An example of a PDF417 bar code is shown below.



An inexpensive portable data base can be encoded into the PDF417 symbol to provide instant, low cost access to detailed information concerning an item’s assembly, shipping, testing, tracking, or repair.

The benefits of PDF417 are ideal for applications that are limited by the constraints of 1-D bar codes. A single PDF417 bar code can replace multiple 1-D bar codes while providing more information, more quickly.

In addition, PDF417 is an error-correcting symbology designed for real-world applications where portions of the labels may be destroyed. PDF417 uses an error correction algorithm to reconstruct undecoded or correct corrupted portions of the symbol. Depending on the level of error correction encoded in the PDF417 symbol, up to half of the symbol can be destroyed or missing and still be decoded. Up to eight levels of redundancy are available for error correction. However, the more redundancy, the larger the symbol.

The uses for PDF417 are many. Areas where PDF417 symbology works extremely well are:

- transportation
 - bills of lading
 - tracking
 - EDI
 - shipping and receiving manifests
- manufacturing
 - inventory control
 - process control
 - equipment calibration
 - asset tracking
 - hazardous material control
 - quality control
 - maintenance records
 - configuration management
 - warranty tracking

PDF417 Applications

The following sections describe how PDF417 is applied in transportation and manufacturing.

Transportation

When you use PDF417, the entire shipping manifest can be encoded into a label that is easily printed and in some cases, costs less than one penny to produce. Outbound shipments can be accompanied by a one page bill of lading encoded with the PDF417 symbology instead of a pre-printed, multi-page form. Also, with labels that hold more data, more information can be provided to help ensure timely and accurate delivery to customers.

In addition, what took operators minutes to enter manually now only takes seconds to accomplish. Plus the chance for error is greatly reduced. Reduction in clerical effort leads to reduced paper flow and reduced clerical cost and enhanced cash flow. This is especially important if you are a larger carrier and may have to enter thousands of bills of lading per day.

Manufacturing

PDF417 is also useful in manufacturing applications. For example, if you are a pipe producer, information that you could include in the PDF417 symbol are:

- coil number
- pipe diameter
- length
- thickness
- weight
- date of manufacture
- customer information such as an account number and location
- catalog or part number

After the pipe is produced, this information can be accessed by others. If the pipe is being shipped directly and is not being inventoried, the information is used directly in the bill of lading. If the pipe is going to stock, the pipe can be scanned going in and out of storage for accurate inventory control.

Once the pipe is sent to the customer, PDF417 can be used to further track the pipe. The pipe can be scanned before it is installed into the application. This ensures that you can trace the pipe back to the point of manufacture should a problem arise. In the case of a natural gas pipeline buried underground, should anything go wrong with pipe that has the same coil number, the pipe's various locations would be known.



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