

2-D Bar Code

Frequently Asked Questions

1. *What do I do if my agency wants to implement 2-D bar code?*

There are several places you can go for assistance. You can access the FTA web site: <http://www.taxadmin.org/fta/edi/2-dcurrent.html> and read the 2-D bar code documents posted. The 2-D bar code Guidance document is intended to help individuals who are getting started in 2-D bar code. The Standards document is a set of “rules” to abide when implementing 2-D bar code. It is important that all agencies comply with the standards. You can also access the NACTP web site at: <http://www.nactp.org/> for information.

There is a list of people to contact included in the 2-D Guidance document. Any of these people are willing to help with questions you may have. Conference calls are another way to get involved with the 2-D bar code process.

2. *What is PDF-417?*

PDF-417 (Portable Data File) is a two-dimensional bar code that can store up to 1,800 printable ASCII characters or 1,100 binary characters per symbol. However, for technical reasons, the expected number of characters for tax applications per symbol is approximately 1,200.

The symbol is rectangular; the shape of the symbol can be adjusted to some extent by setting a standard width and allowing the height to grow with the data. It is also possible to break large amounts of data into several PDF-417 symbols that are logically linked. There is no theoretical limit on the amount of data that can be stored in a group of PDF-417 symbols.

The capacity of PDF-417 can be helpful in applications where the data must travel with the labeled item, where a host database is not available for quick look-up. PDF-417 is used for hazardous materials labeling; storing technical specifications and calibration data on electronic instruments; encoding fingerprints and photographs on the backs of drivers’ licenses and other forms of identification; and now tax return processing.

PDF-417 symbols require a 2-D scanner. A number of scanners are on the market using both laser and CCD camera technologies. PDF-417 symbols can be printed using most printers on the market. However, daisy wheel and some dot matrix printers will not be capable of producing a 2-D bar code that can be scanned successfully.

3. *What is a DLL?*

In computers, a dynamic link library (DLL) is a collection of small programs, any of which can be called when needed by a larger program that is running in the computer. The small program that lets the larger program communicate with a specific device such as a

printer or scanner is often packaged as a DLL program (usually referred to as a DLL file). DLL files that support specific device operation are known as device drivers.

4. *What is the size of a bar code?*

Each tax agency must define the area of the form in which the 2-D bar code is to be placed. Tax agencies must specify the maximum rectangular dimensions that will enclose the bar code and the location of that rectangle on the form. Software vendors will generate an appropriate 2-D bar code within the space defined. The rectangle can be any size. However, software vendors recommend a rectangle that has a 2:1 ratio, that is the width is twice the height, as this allows for the creation of an optimal bar code and therefore will provide the best read rates for the tax agencies. If an area that has a different width to height ratio is specified, the software vendor will generate a 2-D bar code within the space allotted, however read rates may be reduced.

5. *What type of printers can a 2-D bar code be printed on?*

To print a readable bar code, a printer capable of 200 dots per inch (DPI) **minimum** is required, but **300 DPI is recommended**. Higher DPI images will also work and will generally produce sharper bar code images but bitmap size increases may adversely affect print time and memory requirements. A general rule that can be used to determine if a printer is capable of producing a 2-D bar code is if the printer can produce a graphic such as a tax agency seal or business logo, then the printer **should** be capable of producing a 2-D bar code that can be scanned. However, daisy wheel and some dot matrix printers will not be capable of producing a 2-D bar code that can be scanned successfully. See 2-D Bar Code Standards for more information.

6. *How do I start writing the file specifications?*

You need to examine the forms to determine the data you wish to capture. Then you will need to write the specifications (using a program such as Excel). If the information is on the form, you can include the data in the bar code. An example of a line of code is: Bar Code Field: 12; Form Line Number: Step 1; Description: Your Social Security Number; Picture Clause: PIC 9(9); Max. Size: 9; Comments: No hyphens.

After you have a draft of the specifications written, you could ask members of the NACTP to look at the specifications and give you any recommendations. Also, refer to the 2-D Bar Code Standards for further details.

7. *What is Error Correction Code?*

Error Correction Code — There are 9 levels of error correction from 0 to 8. Level 0 allows only error detection. Level 1 through 8 allows for correction and detection. Located in the lower part of the data codeword section. Error detection and correction is one of the most important features of the PDF-417. It is a means of compensating for label defects and misdecodes. Data errors are detected and data integrity is maintained. In the event the symbol is damaged, the data originally encoded must be recoverable. The larger the error correction, the bigger the bar code is. (Example: For an error correction code of 3, the bar code will be smaller than an error correction code of 5.)

8. *Do you need special equipment in order to implement 2-D bar code?*

To implement 2-D bar code for your agency, you will need computers, a DLL, a system to handle the decoded bar code data (front-end/back-end system) and scanners.

9. *How much room do I need to leave on the form for the bar code?*

Minimum space allowed for the 2-D bar code should be 4 inches wide by 2 ¼ inches tall. It is preferable to leave at least ¼ inch of white space around the bar code. The most efficient size (meaning to get the optimal read) is to have the barcode "grow" both in width and height, with as close to a 2 to 1 ratio as possible. If the bar code exceeds the space allowed, there is a possibility of problems generating the bar code.

10. *What is the future of 2-D bar code?*

More and more states are implementing 2-D bar code for tax purposes. It can be used for a variety of other situations: used for hazardous materials labeling; storing technical specifications and calibration data on electronic instruments; encoding fingerprints and photographs on the back of drivers' licenses and other forms of identification; etc. With MacroPDF, the amount of data that can be stored is more than 100 MB in a series of PDF-417 bar code symbols.

11. *How do I educate people (coworkers, tax preparers, taxpayers, etc.) about 2-D bar code?*

There are a number of ways you can educate people on 2-D bar code. Newsletters, tax books, seminars; e-mail; listservs; internet; face-to-face meetings with interested groups of tax practitioners and other tax agencies; district offices; media outlets; etc.

12. *What is the approximate cost to get started with 2-D bar code?*

You will need to either purchase the DLL or write your own. You will need to write the specifications (or pay someone to write the specifications). You will need to write the code, or modify existing code, to allow 2-D bar codes and conversions to replace data entry. You will need to purchase scanners.

13. *How long does it take to implement 2-D bar code?*

This varies for each agency. It could be done in two months or it could take up to a year. It takes time to write the specifications, design the form, write testing scenarios, go through testing with software vendors, write or modify existing code to accept the 2-D bar code data, etc. You are encouraged to *start as early as possible* if you are implementing 2-D bar code. If you are implementing 2-D bar code for the first time, October 1 is the deadline for specifications to be sent to software developers—they need time to program and test. See the standards for more information.

14. *How does processing differ from manual processing and 2-D bar code processing?*

By scanning the returns, the information doesn't require keying the data. Scanning is a lot quicker than manual keying.

15. *What are some advantages and disadvantages of 2-D bar code processing?*

- Advantages:** Quicker processing of returns
More accurate
Requires less temporary employees
No additional cost to taxpayer (as opposed to some E-file options)
- Disadvantages:** Requires more attention to the return (no label placed on top of barcode, good clean copy of return, etc.)
Printer/copier exceptions (copy too light, copy too dark—fills in barcode, etc.)

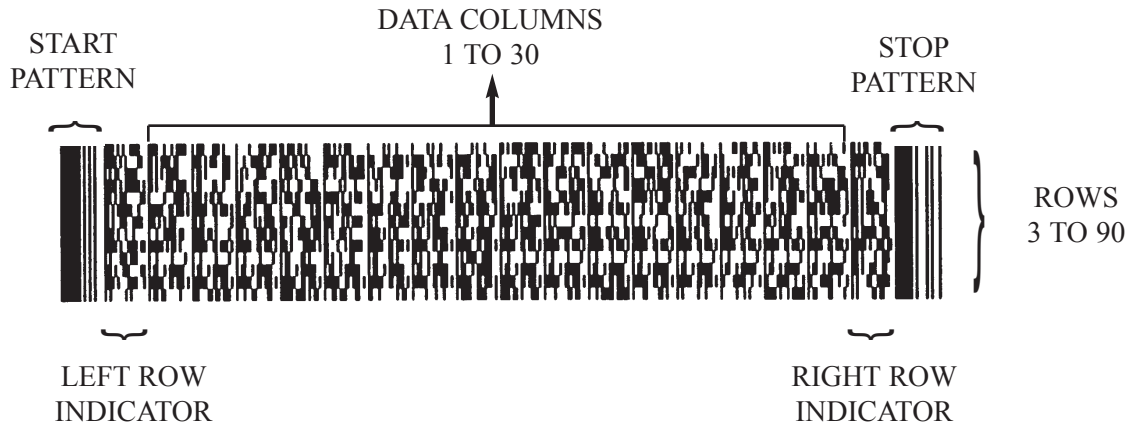
16. *Do you have any advice for an agency wanting to implement 2-D bar code?*

- Get started as soon as possible.
- If the information is on the form, you can capture the data in the bar code.
- Educate people within and outside the agency on 2-D bar code.
- Talk to other agencies that have participated in 2-D bar code processing.
- Read the 2-D Bar Code Guidance and Standards documents.
- Have one contact person for 2-D bar code issues to channel through.
- Participate in conference calls.

What is a PDF-417?

A two-dimensional stacked bar code symbology providing sufficient information density and capacity for both Portable Data File and small item marking applications.

PDF-417 Anatomy



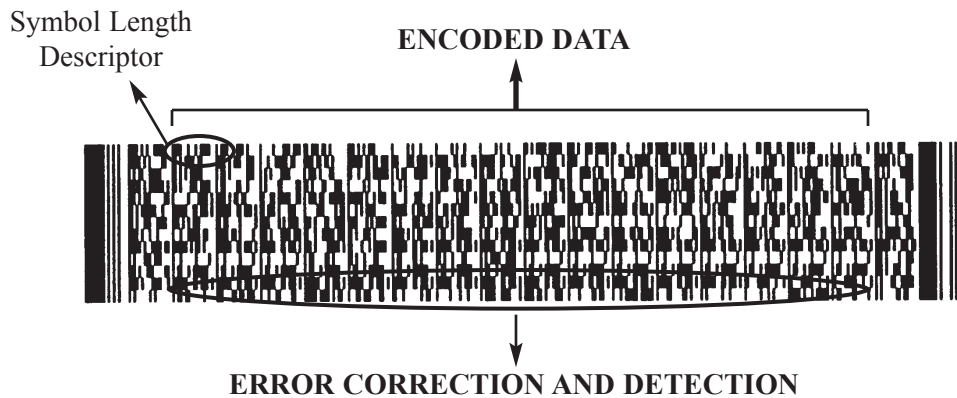
Start and stop patterns are used to delineate where a PDF-417 begins and ends and makes reading symbol bi-directional.

Row indicators are located on the left and right side. The row indicators contain information on number of rows, number of columns and the error correction level.

Data Columns are where data and error correction information are located. Data columns are flexible and can be between 1 and 30.

Rows are variable; can be between 3 and 90. Row height, or Y dimension, is user selectable. Recommended Y dimension is 3X.

PDF-417 Anatomy



Codewords are the basic unit of storage in a PDF-417 bar code. It contains data, or error correction information. Also, used for row indicator information.

Encoded Data is located in the upper part of data codeword section. It includes “Symbol Length Descriptor” or SLD. First codeword in Symbol. Total number of data codewords including itself.

Error Correction Codewords — There are 9 levels of error correction from 0 to 8. Level 0 allows only error detection. Level 1 through 8 allows for correction and detection. Located in the lower part of the data codeword section. Error detection and correction is one of the most important features of the PDF-417. It is a means of compensating for label defects and misdecodes. Data errors are detected and data integrity is maintained. In the event the symbol is damaged, the data originally encoded must be recoverable.

Printer Requirements

In order to print bar codes, a printer must have graphics capability or embedded bar code capability. There needs to be sufficient resolution for intended application.

X Dimension — Bar code size are specified by its X dimension. The X dimension is defined as the width of the narrowest bar. Each bar and space is an exact multiple of the X dimension. The single X dimension is also referred to as a module.

Resolution — X dimension is determined by printers DPI and the number of Pixels Per Module (PPM) $X = \text{PPM} / \text{DPI}$.

Example of 3 PPM PDF-417 Start Pattern: On a 300 DPI laser $X = 3 / 300 = .01 = 10 \text{ mil}$.

Ink Spread — Like other bar codes, PDF-417 is capable of withstanding uniform ink spread. A software technique called pixel shaving (or bar width reduction) uniformly reduces ink spread.

Scaling Errors — Scaling errors are introduced when bar code images are stretched or shrunk. A 100 module bar code must be printed in multiple of 100 pixels.