KOFAX

Enhanced Bar Code

Kofax Is Raising The Bar

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1 Introduction

The ability to accurately detect and decode a bar code is extremely important in the document imaging market. Implementing bar code technology is proven to be an efficient, lower cost solution for the automatic indexing of documents, automatic scanner control, batch separation, job control, and the overall quality assurance of images.

Kofax Image Products has been a leader in providing bar code technology to the document imaging market for the past 15 years. With the release of the Enhanced Bar Code engine, Kofax is proud to continue enabling this valuable tool. As a testament to our commitment to support new advances in the field, the Kofax Enhanced Bar Code engine now incorporates the SwiftDecoder™ algorithm from Omniplanar, Inc.

Whether scanning in color, grayscale, or black and white, the new Enhanced Bar Code Engine from Kofax Image Products is the most accurate bar code recognition software in the document imaging market.

2 Missing Bar Codes = Losing Documents

Bar code technology is well documented and extremely reliable when properly implemented. Generally speaking, if bar codes are created with a reputable encoding engine, to the proper specification, on clean white backgrounds from a 600 dpi printer, they should be read 100% of the time. Bar code failure rates using a laser gun to manually read a bar code (such as the guns used in department stores) occur in the 1 in 3 million range.

However, when we discuss bar codes in document imaging the story changes. Bar code recognition fails for the following reasons:

- Scanners stretch bar codes

- Dot matrix or ink jet printers are often used to create bar codes

- Ribbons and ink cartridges are not replaced as often as they should

- Bar codes are scanned from NCR forms

- Bar code specifications are not respected due to limited space on a form or document

- Quiet zones are often compromised

- Bar codes get torn or creased

- Bar codes are placed on a form at all different angles

- Scanned images are sometimes photocopies or faxes of an original

- Scanners get dirty and bulbs burn out

- Bar codes get stamped, written over, and damaged

The net result of the problems we face in scanning documents with bar codes is that we sometimes cannot control the generation, quality, or integrity of the bar codes we must scan; however, we can be sure to utilize the best recognition engine to reduce the amount of bar codes that are missed.

What is the measurable cost associated with missing bar codes and thus losing documents? Ultimately this depends on whether or not the document was a key piece of evidence in a legal action, the signature page of a contract, or a blank sheet of paper.

The harsh reality is that any missed bar code in a system utilizing bar codes for indexing or document separation can result in a lost image. Lost images are unacceptable. The Kofax Enhanced Bar Code engine is the most powerful, accurate and forgiving bar code recognition and decoding tool in the market.

2.1 Associated Costs of Missed Bar Codes

Many companies have implemented quality control procedures for dealing with poor quality images, OCR verification, index data verification, and bar code recognition. These quality control procedures cost valuable time, resources and money. The question must be asked, what is the cost of a bar code error rate?

Scans Per Day	1% Bar Code Error	QC Time Related to Bar Code Error	Hourly Rate of Scan Operator	Cost – Per Day	Cost – Per Year
10,000	100	2 hours	$15	$30	$6,750
25,000	250	4 hours	$15	$60	$13,500
50,000	500	8 hours	$15	$120	$27,000

3 Enhanced Bar Code Engine

The Enhanced Bar Code engine from Kofax Image Products provides the next generation bar code recognition and decoding technology.

3.1 Key Features

Key features of the Enhanced Bar Code engine include:

- Color Support – The ability to read bar codes directly from 100 or 150 dpi color images.

- Grayscale Support – The ability to read bar codes directly from grayscale images.

- Decodes Smaller More Compact Bar Codes – Saves space on the document.

- 2D Bar Code Support – PDF417, Data Matrix, MaxiCode, QR Code, and Aztec Code are all newly supported 2D symbologies.

- Improved 1D recognition – Code 93, Code 39, Codabar, Code 128, Interleaved 2 of 5, UPC/EAN/JAN, and Postnet.

- Available at no extra charge with Adrenaline 850, 1700, and 650i boards.

- Bundled with the Adrenaline Image Processing Engine for customers wishing to have bar code recognition performed at a server or scan time.

4 Color Scanning

The move to color is happening. Scanner manufacturers are releasing production level document scanners that leverage the ability to scan in color. With this transition to color, it is extremely important that your scan, index, and image processing technology leverage the benefits of color scanning.

4.1 Benefits of Color Scanning

There are many benefits to color scanning in the document imaging market:

- Capturing in color is faster – the fear of correctly converting highlights, stamps, color annotations, pictures, low contrast text, colored backgrounds, etc., to black and white is no longer a concern.

- Bar Code Recognition –150 dpi color images provide more data and information than 200 dpi bitonal images. This is especially true for small and or poor quality bar codes.

- Advanced Color Dropout – this feature is no longer bulb dependent. Also, there is a wider range of colors to dropout on the same form.

- Forms Recognition – the color of the form can now assist in the forms recognition process in addition to a logo/object, text string, or global pattern of the form.

- Easy Document Identification and Retrieval – it is much easier to see the pink copy if the document is scanned in color.

- Document Segmentation – Apply image processing features (black and white or color) to different areas of a particular document.

- Form Routing – it is now possible to route a particular form based upon the color.

- And Much More…

5 Color Bar Code Recognition

Scanning in color provides more data for bar code recognition and decoding, and color scanning preserves the integrity of the bar code lines.

Color 150 DPI
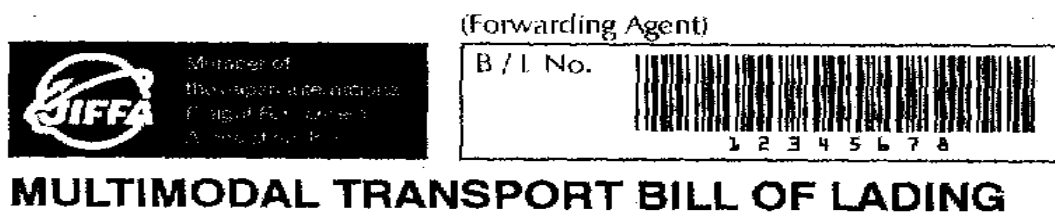
Bitonal 200 DPI

As the two graphics above illustrate, the color 150 dpi image presents a clean image with all the bar code information intact. The bars and spaces are correct widths, straight and clean. The 200 dpi bitonal bar code, the bars, spaces, and widths are severely damaged and even blend together in certain places. This can present issues for some bar code engines.

5.1 Benefit of Reading Directly from a Color Image

- Color images provide more data for the bar code engine.

- Because the bar code integrity is preserved, the engine can work around damage to a bar code.

- Since you are already scanning in color, why sacrifice performance and quality to read the bar code from a black and white image?

- Speed – Thresholding a color image to black and white in order for the bar codes to be detected by a bitonal bar code engine sacrifices precious time, not to mention the fact that the color image provides a much better bar code than a bitonal image.

- Converting a color image to black and white compromises all the benefits that color scanning provides in regards to bar code recognition.

In the samples below, the 150 dpi color bar code was decoded, whereas the 200 dpi bitonal was not. You can clearly see in the 200 dpi image that the stamp was converted

to black, which damaged the bar code. By scanning in color, the Enhanced Bar Code Engine was able to decode the bar code regardless of the stamp.

**150 dpi color
Accurately Decoded**

**200 dpi bitonal
Located, but not decoded**

5.2 Color Bar Code Recognition Performance

Since color and grayscale images have much more data associated with them and the file sizes are larger, there is a natural impact to bar code performance. The Kofax Enhanced Bar Code algorithm has been optimized for color and grayscale scanning so the performance impact is significantly less than algorithms that need to decompress the color file, threshold the image to black and white, and run the black and white image through their bitonal bar code engine. Thresholding takes additional time and sacrifices the quality of the image.

5.3 Color Resolutions

Depending on the bar code symbologies, the bar code generation software, and the character pitch, the scanner resolution for successful bar code reading can very between 75 dpi and 600 dpi color. With the Enhanced Bar Code engine, Kofax recommends the following configuration to ensure reliable and proper decoding at the preferred DPI.

	Linear Bar Codes	Linear Bar Codes	PDF417	PDF417	2D (DataMatrix)	2D (DataMatrix)
Pixels per bar minimum->	Binary	Color/Gray	Binary	Color/Gray	Binary	Color/Gray
	2.75	1.6	2.5	1.5	5	2.75
Scanner DPI	Minimum bar width (mils)	Minimum bar width (mils)	Minimum bar width (mils)	Minimum bar width (mils)	Minimum cell size (mils)	Minimum cell size (mils)
100	27.5	16.0	25.0	15.0	50.0	27.5
150	18.3	10.7	16.7	10.0	33.3	18.3
200	13.8	8.0	12.5	7.5	25.0	13.8
300	9.2	5.3	8.3	5.0	16.7	9.2
600	4.6	2.7	4.2	2.5	8.3	4.6

By utilizing the recommended bar widths you should expect excellent and consistent results using the Kofax Enhanced Bar Code Engine. Symbols will read with lower than the recommended resolutions and widths, but results may vary.

5.4 Why Read Bar Codes At Lower Resolutions?

A common compromise of color scanning is the file size of the image. 200 dpi bitonal images with Group IV compression maintain a relatively small file size for storage; however, color images can be quite large if they are scanned at 200 dpi or greater. By providing users with the ability to scan at 100 dpi and accurately read bar codes, Kofax provides users with an option as to which resolution is best for their circumstances.

6 Grayscale Scanning

The principles and benefits outlined in Section 4 – Color Scanning also apply to grayscale.

7 Improved Recognition

The Enhanced Bar Code not only provides the best color and grayscale support, but it also decodes damaged and challenging bar codes. The algorithm is intelligent enough to identify a damaged or questionable bar code on a document and work around the compromised areas to accurately decode the proper value.

7.1 Damaged Bar Codes

The samples below are Code 39 that were scanned at 200 dpi black and white. Even with the severe damage, the bar codes were detected and properly decoded. The Kofax Enhanced Bar Code engine looks for the best path through the bar code and will work around specific areas of damage.

7.2 Skewed Bar Codes

Regardless of the direction or orientation, the bar codes in the following sample were detected and decoded from a 100 dpi color image. The Enhanced Bar Code engine is intelligent enough to locate and return the bar code value. Many times, as with this example, the bar codes are placed on the document by hand, creating difficulties for other

bar code engines. The Enhanced Bar Code engine searches the entire document regardless for bar codes regardless of their direction.


8 2D Bar Code Support

The Kofax Enhanced Bar Code engine provides support for decoding 2D symbologies: PDF417, Data Matrix, MaxiCode, QR Code, and Aztec Code.

8.1 PDF417

PDF417 bar codes can contain up to 1850 characters of information with built in error detection and nine levels of correction. With the redundancy and error correction a heavily damaged PDF417 bar code can still be read. The information contained in a PDF417 could be anything from an entire database record for a particular customer, URL to a specific website, XML data, or even the text of a document. Since the bar code is so flexible almost any ASCII or text information can be encoded.

Here is a sample PDF417 that is easily decoded at both 150 dpi color and 200 dpi black and white.
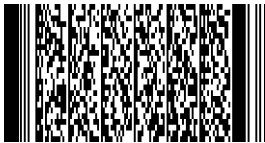
8.2 Benefit to Document Imaging

PDF417 bar codes can contain all of the index information of a particular form or document, virtually eliminating the need for manual key indexing. In addition, to the benefits of automatic indexing, a PDF417 can contain a complete database record for a particular customer or prospect. The data can be easily decoded and populated into the respective database.

A standard 1D bar code can only point to a particular data base record for a customer. The PDF417 can encode the entire database record into a single bar code. It is the equivalent of having a mobile database that travels with the respective document.

8.2.1 Tax Form Example

Every April 15th Americans must pay their State income taxes for the previous calendar year. Many Americans utilize software from TurboTax to assist in determining the amount of tax they are required to pay. Information is keyed into the TurboTax

application based upon specific questions. Once all the information is entered, TurboTax prints the State income tax return. Users then sign the form and mail it to the State.

The State receives the form and processes the information. In some States TurboTax has done them a great favor. They have encoded all of the data on the form into a PDF417 bar code. States where the PDF417 is provided simply scan the tax form and populate their tax database based upon the data encoded in the single PDF417 bar code.

States that do not support PDF417 must both manually key the data into a database or OCR the form, and perform quality control and verification functions to ensure the data is accurate. With the PDF417 bar code, not only is the State guaranteed to get accurate data, but the time necessary to process a PDF417 bar code versus zonal OCR of approximately 30 to 40 fields is significantly less.

In summary, States that utilize a PDF417 to encode the data from tax forms can process the forms much faster with fewer problems. Normally this scenario also translates into a greater cost savings as well.

9 Contact

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