

## Introduction to 2-D Barcodes

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After 30 odd years since the introduction of the “barcode”, most people are familiar with the traditional **1-Dimensional (1-D)** barcode, as typically found on consumer products.



----- 1 Dimension ----->

It is referred to as a 1D barcode, as information is coded only along 1 axis or dimension.

As a means of automatic data entry, barcodes have become popular due to their reading speed, accuracy and superior functional characteristics.

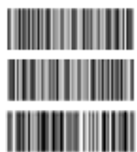
As the utility and applications of barcode grew, so has the market demand for barcodes capable of storing more information (or characters) and be printed in smaller spaces.

Various efforts have been made to increase the amount of information stored by bar codes, such as increasing the number of barcode digits or laying out multiple bar codes.

However, these improvements have also caused problems such as; enlarging the bar code area, complicating reading operations, and increasing printing cost.

**2-Dimensional (2D)** barcodes emerged in response to these needs and problems. As information is coded in 2 Dimensions, greater density is achieved.

2D Code is also progressed from the original “stacked” bar code method (where individual barcodes are literally stacked on top of each other), to the more sophisticated **matrix** type barcodes which high information density.



Multiple bar code layout



2D Code with stacked bar codes  
(stacked bar code type)







2D Code (matrix type)



## Types of 2D Codes

Like 1D barcodes there are several ways they can be encoded, referred to as **sympology**. Likewise, 2D barcodes also have different symologies.

The following table provides a very brief overview of some of the most popular symologies.

Symbology	QR Code	PDF417	DataMatrix	Maxi Code
Example				
Type	Matrix	Stacked	Matrix	Matrix
Data Capacity – Numeric	7089	2710	3116	138
Data Capacity – Alphanumeric	4296	1850	2355	93
Main Features	Large capacity, small print size, High scan speed	Large Capacity	Small print size	High Scan Speed

Another key advantage in using 2D barcodes is the ability to have built in redundancy or error checking as part of the barcode. For example, up to 30% of a barcode based on QRCode symology can be damaged, yet still be readable.

Also, 2D (or 1D) barcodes can be read in any direction, making for more efficient operation. Unlike traditional 1D line scanners, where you need to “orientate” the barcode to effect a read.

To read 2D barcodes you need a barcode reader that can scan a barcode in 2 dimensions. A standard image scanner, as used in camera and video capture devices, does just this.

With the expansion of such low cost cameras, typically based on CCD technology, you will see a growing availability of 2D Barcode scanners at reduced cost, which will become the standard choice of many future applications.