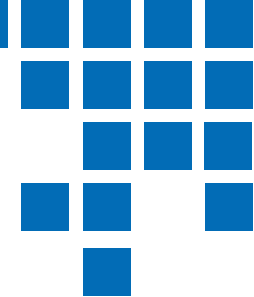Value
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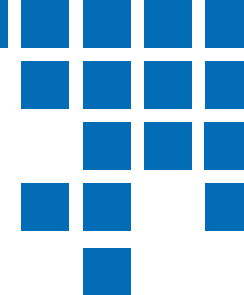
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2D Barcodes

A guide to understanding the types, uses, and benefits of 2D barcodes
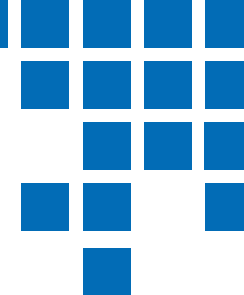
2D Barcodes

There are 2 different classes of barcodes: one-dimensional (1D) and two-dimensional (2D).   Most people are familiar with 1D barcodes, which are linear barcodes, like UPC codes found on consumer goods. However, two-dimensional (2D) barcodes are rapidly catching on in many industries.   Two-dimensional (2D) barcodes (sometimes called Matrix codes) look like squares or rectangles that contain many small, individual dots. They carry information both horizontally and vertically. A single 2D barcode can hold a significant amount of information and may remain legible even when printed at a small size or etched onto a product.

1D Barcode vs. 2D Barcode

2D Barcodes - Fun Facts

→ UPS uses a 2D barcode called Maxicode, which can be scanned quickly as packages fly down the conveyor belt.

→ The U.S. Department of Defense uses DataMatrix, a 2D barcode capable of containing large amounts of information in a very small area.

→ The American space agency NASA was one of the earliest organizations to make widespread use of data matrix codes, in the mid-1980s: it engraved them onto parts from space rockets, such as the Space Shuttle, because they didn't come off, like paper labels, and could store so much more information.

→ 2D barcodes have become so popular in Japan that they are used on billboards so consumers can scan them as they are driving by.

→ According to Honeywell, a recent VDC Report found that "the average annual growth in the 2D imaging sector is likely to be in the region of 17 to 22 percent."

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What are 2D Barcodes?

2D barcodes are a graphical image that stores information both horizontally -- as one-dimensional bar codes do -- and vertically. Just like 1D barcodes, there are several types of 2D barcodes. The following are examples of different types of 2D barcodes.

QR Codes:

QR Codes are 2D matrix barcodes with a strong consumer focus, often used in tracking and marketing such as advertisements, magazines, and business cards. Free to use, flexible in size, have a high fault tolerance, and have fast readability, though they can't be read with a laser scanner.

Datamatrix Codes:

Datamatrix codes are 2D barcodes used to label small items, goods, and documents. Their tiny footprint makes them ideal for small products in logistics and operations.
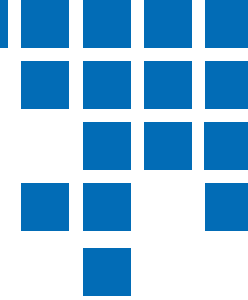
Aztec Codes:

Aztec codes are 2D barcodes used by the transportation industry, particularly for tickets and airline boarding passes. The barcodes can still be decoded even if they have bad resolution, making them useful both when tickets are printed poorly and when they're presented on a phone. In addition, they can take up less space than other matrix barcodes because they don't require a surrounding blank "quiet zone," unlike some other 2D barcode types.

PDF417 Codes:

PDF 417 codes are 2D barcodes are used in applications that require the storage of huge amounts of data, such as photographs, fingerprints, signatures, text, numbers, and graphics. They can hold over 1.1 kilobytes of machine-readable data, making them much more powerful than other 2D barcodes.

MaxiCodes:

Maxicode is an international 2D (two-dimensional) barcode that is currently used by UPS on shipping labels for world-wide addressing and package sortation. MaxiCode symbols are fixed in size and are made up of offset rows of hexagonal modules arranged around a unique finder pattern. MaxiCode includes error correction, which enables the symbol to be decoded when it is slightly damaged.

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Why would you use 2D Barcodes?

There are several advantages of 2D barcodes over 1D barcodes.

Advantages of 2D Barcodes:

1. 2D barcodes can hold multiple points of data (over 2000 characters) and are not limited to numbers or even the English language. 2D barcodes can hold video, pictures, Chinese alphabet characters, etc . Most 1D barcodes top out at 20 characters.

2. Time Saving - get multiple points of data in one scan vs. multiple scans. Dramatically speeds data capture and removes the decision-making of entering a quantity and selecting a unit of measure away from the user.

3. Smaller in Size - 2D barcodes contain lots of information in a smaller footprint, reducing the size of labels required and allowing more flexibility when there are space constraints.

4. Increased Accuracy - 2D labels are more reliable and can be read from any angle, even if slightly damaged. In fact, 2D barcodes have an accurate read rate of nearly 100%.

5. Some customers / industries are recommending 2D barcodes. Their tiny footprint makes them ideal for small products in logistics and operations. In fact, the US Electronic Industries Alliance (EIA) recommends that they be used to label small electronic components.

6. 2D barcodes can help with the sales and marketing of your product by embedding links to websites, videos, brochures, etc. and they can be easily scanned by any mobile device.

7. Future Proof - 2D scanners can read both 1D and 2D barcodes, keeping your business ready for the future.

8. Cost effective - since 2D barcodes can be read by any mobile device and due to the increased use of BYOD (bring your own devices), 2D scanning has become much easier and affordable to implement.
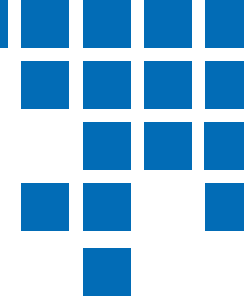
2D Barcodes in Manufacturing

2D Barcodes have been prevalent for several years across industries such as Healthcare, Food & Beverage, Government, Warehousing and Transportation. The Manufacturing Industry, however, has always seemed to lag behind, sticking to legacy applications and linear barcodes for traceability. Due to increasing end user requirements regarding product lot traceability, some manufacturers have had no choice but to leap on the 2D bandwagon.

How are barcodes used in Manufacturing currently?

- Manufacturers of component reels have begun to transition to 2D DataMatrix barcodes due to the amount of lot information required by Manufacturing and Assembly. 2D barcodes simplify the label application process, enabling component manufacturers to utilize one barcode on their reels, instead of multiple 1D barcodes.

- It has become essential to not only identify each and every Print Circuit Board (PCB) with a barcode, but also to identify the lot that a particular PCB originated from. If a PCB fails, there's a good probability that "array or lot" will also fail. Applying a 2D barcode allows the entire lot to be identified and tracked in case of failure.

- Material Rejects - with final testing comes material rejects, 2D barcodes help identify all components and their lots, helping identify potential larger issues.

- Employee ID Badges: Although linear barcodes are still the most popular, they only include the Employee ID #. By adding 2D bar codes to the badges, they enable information such as clearance/approval to be included, preventing unauthorized individuals from completing tasks.

- Job Orders - by including 2D barcodes on job orders, manufacturers can enable line operators, assembly and test, quality, warehousing and shipping departments to easily identify product. This minimizes that amount of barcodes on each sheet and results in fewer scans, greater outputs, better accuracy, and less impact on the scanning hardware.

- Asset Tracking - when equipment isn't very large, the ability to have a 2D barcode that includes part #, date of implementation, serial #, warranty information, description, etc. is very beneficial with tracking product.

SAMPLE PACKING SLIP USING 2D BARCODES

A 2D barcodes can contain much more information than a single 1D barcode. The sample packing slip below shows how several 1D barcodes can be consolidated into a single 2D barcode.

COMPANY LOGO
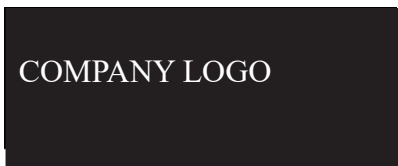
Packing Slip

COMPANY
5555 SOUTH ANYWHERE ST.
ANYWHERE, OH 55555
USA
555-555-5555

Bill To: 106210

Ship To: (1)

(K) Cust PO   1599990

(11K) Packing Slip: 28602

2D BARCODES

(6D) Ship Date   20151007

1D BARCODES

(P) Customer Part   458-1150-ND

(4L) COO   US

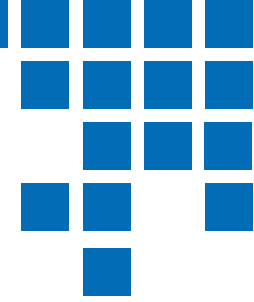(1P) Supplier Part   SC628R

(4K) PO Line   1
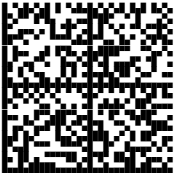
(9D) Date Code 4567

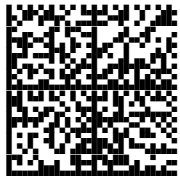(1T) Lot Code   456789

(Q) Quantity 1

SAMPLE LABELS USING 2D BARCODES

A 2D barcode can contain much more information in a much smaller space than a 1D barcode. The labels below have a single 2D barcode, which allows them to take up much less label space.

(P) Customer Part Number:	**MSE14LCH2-ND**
(1P) Supplier Part Number:	**MSE14LCH2**
(Q) Quantity:	**50**
(9D) Date Code:	**1529**
(1T) Lot Code:	**1529-4**
(4L) Country Of Origin:	US

RoHS COMPLIANT

SEAL DATE: 09/16/15

From

To

COMPANY

COMPANY

PO Number (K):	**1599990**
PO Line Number (4K):	**7**
Customer Part Number (P):	**458-1029-ND**
Supplier Part Number (1P):	**SC628**
Quantity (Q):	**10**
Packing Slip (3S):	**28560**
Date Code (9D):	
Lot Code (1T):	
Country of Origin (4L):	
Package Count (13Q):	**0**

Sources

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"10 Ways to use 2D Barcode Scanning in Manufacturing, Part 2" by Jeremy Miller

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